

# **ASSESSMENT OF INDUSTRY ATTITUDES ON COLLABORATING WITH THE U.S. DEPARTMENT OF DEFENSE IN RESEARCH AND DEVELOPMENT AND TECHNOLOGY SHARING**



**A REPORT FOR THE DEPARTMENT OF THE AIR FORCE  
PREPARED BY THE U.S. DEPARTMENT OF COMMERCE  
BUREAU OF INDUSTRY AND SECURITY  
OFFICE OF STRATEGIC INDUSTRIES AND ECONOMIC SECURITY**

**JANUARY 2004**

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# TABLE OF CONTENTS

<b>Table of Contents .....</b>	<b>iii</b>
<b>Executive Summary .....</b>	<b>i</b>
<b>PART I – Database Description.....</b>	<b>1</b>
<b>1. Introduction.....</b>	<b>1</b>
1.1 Background.....	1
1.2 Technologies Under Review.....	2
1.2.1 Advanced Composites Manufacturers .....	2
1.2.2 Batteries .....	2
1.2.3 Power Electronics .....	2
1.2.4 Wireless Broadband.....	3
<b>2. Surveyed Company Characteristics.....</b>	<b>5</b>
2.1 Defense and non-Defense Contractors.....	5
2.2 Primary Business Activities.....	5
2.3 In-House vs. Outsourced Activities .....	7
2.4 Financial Indicators.....	11
<b>PART II – Database Analysis .....</b>	<b>15</b>
<b>3. Survey Review .....</b>	<b>15</b>
3.1 Interpreting the Survey Responses.....	15
3.2 Interpreting Factor-Rating Questions .....	16
3.3 Written Questions .....	16
3.4 Yes/No Questions .....	16
<b>4. Research and Development Projects.....</b>	<b>17</b>
4.1 R&D Communication with the Federal Government .....	17
4.1.1 Non-Defense Federal Agencies and Labs.....	17
4.1.2 Defense Agencies and Labs .....	18
4.2 Factors that Motivate R&D Communication.....	18
4.2.1 Motivation to Communicate with Other Companies .....	18
4.2.2 Motivation to Communicate with Non-Defense Federal Agencies.....	19
4.2.3 Motivation to Communicate with Defense Agencies .....	20
4.3 Methods to Inform .....	22

4.3.1	Methods to Inform Other Companies .....	22
4.3.2	Methods to Inform Non-Defense Federal Agencies .....	23
4.3.3	Methods to Inform Defense Agencies .....	24
4.4	Reluctance to Communicate with the Public Sector .....	24
4.4.1	Reluctance toward Non-Defense Federal Agencies .....	25
4.4.2	Reluctance toward Defense Agencies .....	26
4.5	Recommendations for Eliminating Reluctance .....	27
4.6	Interaction with Federal Agencies .....	28
4.6.1	Productivity .....	28
4.6.2	Limitations to Interaction .....	30
4.7	Collaboration on R&D Programs .....	32
4.8	Recommended Changes in Government Policies .....	35
4.9	Other Issues with Industry-Government R&D Interaction .....	37
4.9.1	Types of Agreements .....	37
4.9.2	Product Cycle Times .....	38
4.10	Future Alternatives: R&D Projects and DoD Database .....	40
4.10.1	Potential DoD Database .....	41
4.10.2	Reluctance to Participate in DoD R&D Database .....	42
<b>5.</b>	<b>Federal Procurement and Contracting .....</b>	<b>45</b>
5.1	Federal Contracting .....	45
5.2	Government Procurement Practices .....	46
5.3	DoD Logistics Management and the Supply Chain .....	47
5.4	Awareness of Government Procurement Opportunities .....	49
5.5	DoD Suppliers .....	51

## **Appendix I – Generic Survey**

## **Appendix II – Detailed Responses by Technology**

## **Appendix III – Shared Technologies by Technology Sector**

## **Appendix IV – Company Reported Product Descriptions**

## **Appendix V – Written Comments**

## **Appendix VI – White Paper from Aerospace Industry Association**

## ***Executive Summary***

At the request of the U.S. Department of the Air Force, an assessment was undertaken by the U.S. Department of Commerce Bureau of Industry and Security (BIS) in conjunction with Trotta Associates to review attitudes of private companies toward sharing new or promising technologies developed for commercial use with the Department of Defense (DoD). The primary goals of the study were:

- To examine private industry experiences when communicating, interacting, and collaborating with DoD as well as non-defense federal agencies and the private sector, specifically related to research and development (R&D) programs;
- Based on these experiences, to identify actions DoD agencies can take to encourage more R&D ties between private industry and government, in order to draw on new commercial technologies, thus improving defense technology, eliminating duplicate development programs, and saving materials and resources.

BIS designed and conducted the industry survey instrument and collected and entered the responses into the database which was utilized for analysis by Trotta Associates. Surveys were mailed to companies in the following technology areas: *Advanced Composites*, *Power Electronics*, *Batteries*, and *Wireless Broadband*. The selection of these particular technologies was essentially based on three criteria: 1) areas important to DoD; 2) technologies driven by commercial markets; and 3) areas with different industry structures and market forces.

Surveys were sent to 1,022 companies representing the four technologies. After the initial surveys were distributed, the Air Force requested that additional surveys be sent to a special category of defense-supplier companies primarily in the aerospace and electronics field. Forty-seven special category companies received surveys.

To facilitate analysis, the survey responses were divided into two major sub-groups: defense contractors and non-defense contractors. Under this criteria, not counting the special category, 447 firms responded to the survey, of whom 158 (35%) were classified as defense contractors. In addition, 44 companies in the “special category” responded, bringing the total response to 491.

## **Survey Findings**

- About 85 percent of the respondents, both defense and non-defense, have an R&D program. Thirty-three percent of respondents consider R&D a major part of their business.

- Defense contractor motivations to communicate information about R&D and technology programs included potential future contracts or grants from the public sector and alerting the commercial market in anticipation of future sales. Non-defense contractors indicated alerting the commercial market as the strongest motivation but were generally weak in all motivations with regard to the public sector.
- The preferred methods to inform others of R&D and technology activities were one-on-one briefings and presentations at technical meetings. An emerging method appears to be through business web pages. Non-defense contractors reported limited use of methods to inform the public sector.
- About 45 percent of the respondents indicated a reluctance to discuss R&D programs with DoD. Indeed, only about one-third of defense contracting companies reported that they confer with or seek the assistance of the federal government on research as well as engineering and development. Less than 5 percent of non-defense contractors reported they did so. These companies' main concerns were the inadequacy of government funding and the difficult environment encountered while working with the federal government.
- Respondents also reported that primary barriers to increasing interaction with the public sector were inadequate funding and a lack of information. Several non-defense contractors also considered smaller business size an important constraint. More specifically, involvement with DoD might improve if opportunities were more easily identifiable and timely notification was given.
- Few companies have formed agreements, such as joint ventures or cooperative R&D agreements (CRADAs), with any federal government agency since 1998.
- Nearly two-thirds of defense contractors would be willing to place R&D project information in a restricted access DoD database. Only 41 percent of non-defense contractors, however, indicated willingness. Concerns were loss of proprietary data, limited economic benefit, and reduced competitive advantage.
- Companies identified the following government contracting and procurement procedures that discourage firms from seeking public sector opportunities: uncertain government funding and product demand; narrow profit margins; complex solicitations; and frequent re-competitions. Non-defense contractors specifically cited DoD cost accounting standards, payment delays, and cycle times between bid and award.

- By a wide margin, both groups of contractors indicated that e-mail was the most preferred method to become aware of government opportunities. Other methods included broad agency announcements, advanced planning briefings with industry, and a central DoD website.
- The chief reason some firms stopped contracting for DoD procurement in recent years was that the commercial market was more profitable. In addition, some cited the decrease in defense demand and onerous acquisition regulations.

Procurement complexity is the number one barrier to R&D interaction cited by defense contractors. The regulatory environment and bureaucracy impose costs on private companies that discourage and sometimes prevent companies from interacting with the federal government, an experience that differs greatly from the commercial markets. These firms cite federal procurement procedures that require added and specialized paperwork as well as added employees to process the paperwork; federal product specifications that may necessitate using older equipment not suitable to the competitive commercial market; and speed to market and longer product cycles, which again are critical in a competitive commercial market. These added costs – added employees, maintenance of older equipment and longer product cycles – are passed through to the government. This issue is of great enough magnitude to force some companies to exit the field.

Respondents recommended specific improvements to ease the complexity of interacting with non-defense and defense federal agencies. These included: increasing the efficiency of the contracting process to come more in line with commercial contract practices; streamlining the mechanism for contacting individuals or departments; adopt more multiyear procurements to encourage R&D interactions; and reducing competition between government labs and industry.

Surveyed companies considered financial incentives to include return on investment, federal research grants, eventual market value, or tax incentives. Both DoD contractors and non-DoD contractors saw inadequate financial rewards as a considerable concern when discussing and developing R&D programs with government agencies. Primary concerns were inadequate R&D funding on a timely basis, lack of sensitivity to firms' needs for commercial profit and return, and inconsistent funding for longer-term research. Surveyed firms indicated that the uncertainty of federal budget cycles contributes to a number of these concerns.

Respondents recommended constructive improvements including: increasing government funding for basic science and research; allowing a greater return on investment; offering tax and other incentives to collaborate with DoD; and improvement in payment processes.

Communications is the number one issue cited by non-defense contractors. The major impediment confronting inexperienced companies is reaching a competence in acquiring information on public opportunities and procedures. Most companies indicated they prefer one-on-one contacts and technical meetings as methods of communicating. Additionally, e-mail has become a preferred, inexpensive method of communication.

Companies recommended that federal agencies do the following: research available commercial work before funding redundant government projects; host regular information sessions; expand communication of collaborative opportunities and federal grant requirements; and specifically, provide public lists of new technologies DoD is seeking.

Many companies consider sharing intellectual property with the government a risk, especially if it also has commercial application. Development and protection of competitive knowledge and information costs money but also creates value in the marketplace, and in some cases represents the lifeblood of a firm. Intellectual property may include engineering know-how, designs, strategic plans, manufacturing processes, or knowledge of emerging markets. Respondents recommended potential solutions, including legal and proprietary protection training programs for federal employees, and government-industry contracts requiring proprietary protection clauses.

Product irrelevance was often cited by current non-DoD contracting firms as a barrier to working with federal agencies. These firms felt that their products were not useful to the federal government; their corporate structures or orientation were not conducive to interaction with the government agencies; their operations were firmly committed to the commercial market; or their processes did not include R&D.

Small business is at a relative cost disadvantage in complying with paperwork and other government regulations. Smaller companies, however, may excel at build-to-print on a cost competitive basis because of low overhead and quick turnaround. Small firms rarely engage in formal research, although individuals employed by these firms may uncover new processes and concepts in the course of regular operations. Respondents recommended the reduction or elimination of the growing requirement for cost sharing in the case of small business.



# PART I – DATABASE DESCRIPTION

## 1. Introduction

### 1.1 Background

At the request of the U.S. Department of the Air Force, an assessment was undertaken by the U.S. Department of Commerce Bureau of Industry and Security (BIS) in conjunction with Trotta Associates to review attitudes of private companies toward sharing new or promising technologies developed for commercial use with the Department of Defense (DoD).

The U.S. Air Force requested that BIS collect industrial information needed for this review. BIS has authority under section 705 of the Defense Production Act of 1950, as amended (50 U.S.C. 2061 *et seq.* ), Executive Order 12656, and Executive Order 12919 to obtain basic economic and industrial information from private concerns where pertinent to national defense needs.

Written surveys were prepared by BIS, cleared by the Office of Management and Budget, and then disseminated to industry in the fall of 2001. A follow-up mailing was sent to delinquent companies in June 2002 (see copy of the survey in Appendix I). A total of 629 companies responded to the survey, and of these 491 provided usable data. Unusable surveys included 124 companies exempted from completing the document<sup>1</sup> and 14 others that were no longer in business. The figure of 629 respondents includes all companies recorded or entered into the database by September 30, 2002. The following table provides a tally of the survey responses for each technology.

<b>Table 1.1 – Record of Technology Surveys</b>			
<b>Category</b>	<b>Received</b>	<b>Mailed</b>	<b>% Returned</b>
Advanced Composites	130	289	44.98%
Batteries	55	134	41.04%
Power Electronics	130	300	43.33%
Wireless Broadband	132	299	44.15%
Special	44	47	93.62%
Sub Total	491	1,069	45.93%
...Exemptions	124		
...Out of Business	14		
Unusable Responses	138		
Adjusted Results	629	1,069	58.84%

Source: BIS R&D Survey Database

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<sup>1</sup> Companies qualified for exemption if (1) they did not directly or indirectly engage in any form of research, product development, or manufacturing related to components, materials, devices, systems, software, or services or (2) they operated solely as a retailer.

## **1.2 Technologies Under Review**

### **1.2.1 *Advanced Composites***

Advanced composites are generally defined as a family of lightweight structural materials with reinforcing fibers such as carbon or high strength fiberglass embedded in a matrix material.

Advanced composites are generally distinguished from other reinforced materials by the use of these continuous high-stiffness, high-strength fibers. Advanced composites have gained broad usage in aerospace and defense applications including aircraft, land vehicles, spacecraft, and ships. Ruggedness and reliability of these materials are major differences between commercial and military applications for these advanced composites.

### **1.2.2 *Batteries***

Batteries convert potential chemical energy into electrical energy. Such devices include: alkaline cell storage batteries, rechargeable batteries, lead-acid storage batteries, and batteries of nickel cadmium, and nickel hydrogen. Research is being conducted on advanced batteries composed of lithium-aluminum/metal sulfide, lithium polymer, and nickel/metal hydride.

The commercial battery industry is driven by market needs for small, long-lasting, cost-effective, rechargeable batteries. Batteries are the limiting factor in the design of products requiring long life and low drain. Cost seems to be the principal driver for much of the commercial market. While there are special items (e.g., laptop computer batteries, space craft batteries, etc.) where this is not necessarily the case, the high volume in most markets makes cost (not performance) a major competitive factor. DoD, on the other hand, needs a more limited number of high reliability, long life, light weight devices to power the new generation of military equipment carried by the modern soldier. There is also the need for long storage life, highly reliable batteries for various weapons applications. As such, in defense applications, cost is less a factor than weight or performance.

### **1.2.3 *Power Electronics***

Power electronics are based on solid-state electronics technology and include programmable logic controllers. More specifically, they are programmable universal electrical power converters and controllers with no moving parts. They convert direct current from a battery to alternating current equivalent to utility power and vice versa. They can also control the speed of any kind of motor and control the load on any kind of electrical generator or alternator. Enabling technologies are the development of high-speed, high-powered, high-efficiency (low forward voltage drop) semiconductors such as the MOS-controlled thyristor (MCT) as well as highly efficient soft-switching flexible inverter electrical circuit topologies such as the Auxiliary

Resonant Commutated Pole (ARCP) inverter. Applications include: power control and conversion requirements needed in fuel cells, wind power electrical generation, direct current (DC) to alternating current (AC) power conversion and AC to DC conversion. Ruggedness and reliability of the products are the major differences between commercial and military applications.

The power electronics industry encompasses an array of markets including: computers, telecommunications, industrial equipment controls, aerospace, and power generation and distribution—heavy users of power electronics. Specific products include ac/dc power supplies, surge protectors, power-conditioning devices, and uninterruptible power systems.

#### **1.2.4      *Wireless Broadband***

Wireless communication equipment refers to complete radio based communication systems including mobile switching, transmission, and subscriber equipment for the provision of cellular paging and personnel communication services. Wireless broadband equipment delivers high-speed digital communication over a wireless medium between two separate sites. With today's networks expanding geographically and struggling to maintain data-optimized and high-bandwidth connectivity, broadband wireless is quickly emerging. The major performance difference between commercial and defense applications is overall system transportability (especially the fixed components such as relay stations). Operating in the 20 to 30 gigahertz end of the Ka-band spectrum, satellites also will provide another avenue of broadband wireless data transmission.



## 2. Surveyed Company Characteristics

### 2.1 Defense and non-Defense Contractors

Section V of the survey distinguished the companies in the database between defense and non-defense suppliers. Question 11 was used to determine the major division between defense and non-defense contractors used throughout this report. A total of 158 companies reported they had acted as a prime or a sub-contractor on a DoD contract within the past five years and 269 reported they had not.

<b>Table 2.1 – Questions V.11-19. Defense/Industry Involvement</b>				
	<b>DoD Contractors</b>		<b>Non-DoD Contractors</b>	
	<b>Number of Responses</b>	<b>% Yes</b>	<b>Number of Responses</b>	<b>% Yes</b>
11. Has your Business acted as a Prime or a Sub-Contractor on a DoD contract within the past five years?	158	100.0%	269	0.0%
12. If you answered “Yes” to Question 11, did your Business sell product to the Department of Defense as a commercial or non-developmental item?	150	60.0%	7	0.0%
13. Does your Business currently have a defense contract?	157	59.9%	266	1.5%
14. If your Business sells products and services directly to the Department of Defense, are they sold at catalog pricing, i.e., from a published price list?	135	41.5%	91	31.9%
15. Do you have a separate business unit, subdivision, or office that is devoted exclusively to providing R&D services to the federal government?	158	7.6%	263	0.8%
16. Do you have a separate business unit, subdivision, or office that is devoted exclusively to manufacturing products for the federal government?	157	8.9%	262	0.0%
17. Do you use the same employees, facilities and equipment to manufacture commercial and DoD products?	157	93.6%	145	63.4%
18. If your Business sells product directly to the DoD, is the production lead-time quoted the same as quoted to your commercial customers?	124	81.5%	47	76.6%
19. Is your Business registered in Central Contractor Registration (CCR)?	135	74.1%	242	19.0%

Source: BIS R&D Survey Database

### 2.2 Primary Business Activities

Information on the surveyed companies’ major business activities ( e.g., manufacturing, design, research) was requested in Part II Products and Services on page 1 of the survey. A total of 482 firms completed this information. Close to 84 percent of these firms reported manufacturing and 53 percent reported design as major activities in which their companies engage. Assembly operations were reported by about 38 percent and research by one-third of the respondents.

The primary activities varied by technology group. In the case of advanced composites, more than 95 percent of the companies identified themselves as manufacturers, the highest percentage within any group. However, advanced composite firms had the lowest proportion of firms in each of the other business activity areas, usually by a wide margin. In part, this is due to the large number of smaller firms engaged in the technology. The production process is also more labor intensive than the others, and economies of scale opportunities appear to be lacking, given the current market and processing technology. The following table presents the major business activities by technology group.

<b>Table 2.2 – Major Activities Engaged in by Surveyed Firms</b>							
<b>Number of Firms Reporting Each Activity</b>							
Technology → ↓ Activity Areas	Advanced Composites	Batteries	Power Electronics	Wireless Broadband	Sub Total	Special	Total
Manufacturing	123	48	94	99	364	39	403
Design	21	24	86	93	224	30	254
Assembly	15	23	60	53	151	31	182
Research	19	22	53	49	143	19	162
Test & Evaluation	13	17	43	36	109	22	131
Integration	2	7	40	40	89	19	108
Fabrication	14	6	35	15	70	21	91
Exporter	12	11	16	28	67	7	74
Repair & Overhaul	4	3	19	23	49	20	69
Importer	7	11	8	8	34	3	37
Other	0	3	8	19	30	7	37
Inspection	0	1	4	6	11	6	17
# of Respondents	129	54	126	130	439	43	482
<b>Percent of Firms Reporting Each Activity</b>							
Manufacturing	95.4%	88.9%	74.6%	76.2%	82.9%	90.7%	83.6%
Design	16.3%	44.4%	68.3%	71.5%	51.0%	69.8%	52.7%
Assembly	11.6%	42.6%	47.6%	40.8%	34.4%	72.1%	37.8%
Research	14.7%	40.7%	42.1%	37.7%	32.6%	44.2%	33.6%
Test & Evaluation	10.1%	31.5%	34.1%	27.7%	24.8%	51.2%	27.2%
Integration	1.6%	13.0%	31.8%	30.8%	20.3%	44.2%	22.4%
Fabrication	10.9%	11.1%	27.8%	11.5%	16.0%	48.8%	18.9%
Exporter	9.3%	20.4%	12.7%	21.5%	15.3%	16.3%	15.4%
Repair & Overhaul	3.1%	5.6%	15.1%	17.7%	11.2%	46.5%	14.3%
Importer	5.4%	20.4%	6.4%	6.2%	7.7%	7.0%	7.7%
Other	0.0%	5.6%	6.4%	14.6%	6.8%	16.3%	7.7%
Inspection	0.0%	1.9%	3.2%	4.6%	2.5%	14.0%	3.5%

Source: BIS R&D Survey Database

Most companies in the data sample engage in several of the above listed activities, and a few companies engage in all or nearly all of them. Generally, companies that engage in multiple activities are both larger and possess a broader range of capabilities; not surprisingly, these larger companies are also more likely to interact with DoD. The following table indicates that DoD

contractors as a rule engaged in more activities than non-defense respondents. The column on the far right, labeled “Total,” shows that respondents with DoD contracts engaged in an average of 4.31 major activities, while those that did not averaged only 2.51 areas.

**Table 2.3 – Range of Activities Engaged in by Defense Contractors vs. Non-Defense Contractors  
(number of activities per firm; averaged by technology)**

	Advanced Composites	Batteries	Power Electronics	Wireless Broadband	Sub-Total	Special	Total
A. DoD Contractors	2.62	3.92	4.35	4.35	4.06	5.36	4.31
B. Non-DoD Contractors	1.64	2.56	3.02	3.15	2.49	3.75	2.51
Overall	1.81	3.20	3.73	3.60	3.07	5.21	3.27
% Difference (A/B)	59%	53%	44%	38%	63%	43%	72%
Number of Respondents							
A. DoD Contractors	21	24	65	48	158	39	197
B. Non-DoD Contractors	101	27	57	81	266	4	270
Overall	122	51	122	129	424	43	467
% DoD Contractors	17.21%	47.06%	53.28%	37.21%	37.26%	90.70%	42.18%

Source: BIS R&D Survey Database

## 2.3 In-House vs. Outsourced Activities

Part II, Question 3 of the survey asked companies to identify activities they perform in-house versus those they contract out to other firms. Business integration, as used here, simply refers to the extent a firm performs various activities in-house or within the company. This could apply to vertical integration or horizontal integration, or a combination of both. A total of 465 companies responded to the question. Respondents included 156 defense contractors, 265 non-defense contractors, and 44 companies in the special category. In general, companies in each technology perform their own R&D, create their own products, and rely on in-house design and engineering. About one-third of the companies also manufacture most of their own parts; less than one-fourth purchase more than half the parts they use. In addition, about one in eight firms largely manufacture on a build-to-print basis.

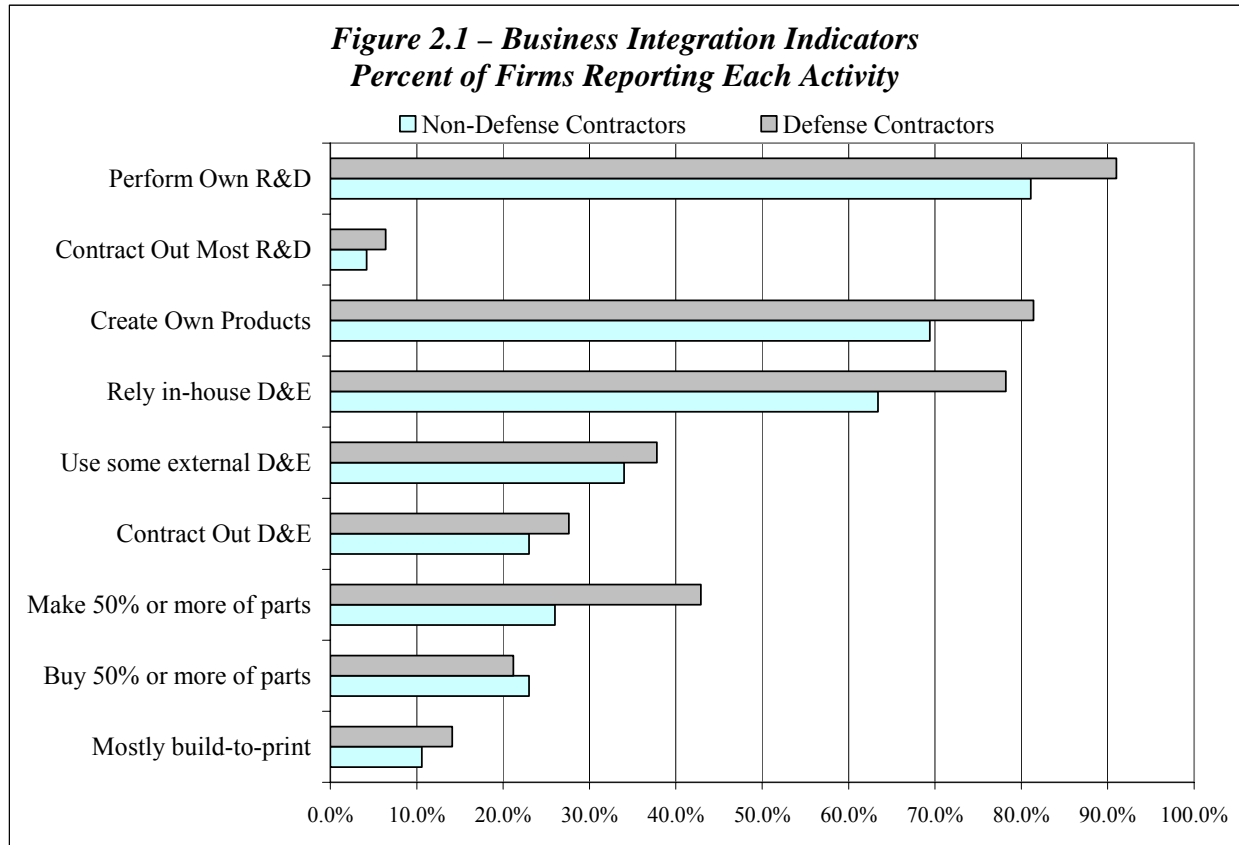
The responses to these activities differed in magnitude between non-defense and defense contractors, and across technologies. Defense contractors, for example, scored higher than non-defense contractors in terms of in-house activities. That is, relatively more defense contractors perform their own R&D, create their own products, and rely on in-house design and engineering. In addition, 43 percent of defense contractors manufacture at least 50 percent (or more) of their own parts, while non-defense contractors recorded only 26 percent. As for build-to-print, defense contractors outsourced slightly less than non-defense companies, 14 to 11 percent, although the function was a minor portion of either sector’s activity. The following table highlights the survey responses by contractor status and technology.

<b>Table 2.4 – Integration Profile of Companies by Technology</b>										
Technology	Number of Companies: Total	Perform own R&D	Contract out most R&D	Create own products	Rely on in-house Design & Engr.	Use Internal/external Design & Engr.	Contract out Design & Engr.	Manufacture 50% of parts in-house	50% or more of parts contracted out	Largely manufacture on build-to-print basis
Number of Defense Contractors Reporting in Each Area										
Adv Comp	21	17	2	18	13	7	3	8	1	6
Batteries	24	21	1	20	21	5	5	13	4	3
Power El	63	59	4	50	52	28	19	25	15	10
Wireless	48	45	3	39	36	19	16	21	13	3
Number of Non-Defense Contractors Reporting in Each Area										
Adv Comp	101	82	4	68	53	35	21	30	3	18
Batteries	27	17	3	19	17	10	5	8	7	2
Power El	56	45	1	39	38	17	14	15	16	4
Wireless	81	71	3	58	60	28	21	16	35	4
Totals of Defense and Non-Defense Contractors and Special Category										
Non-DoD	265	215	11	184	168	90	61	69	61	28
DoD	156	142	10	127	122	59	43	67	33	22
Special	44	32	1	29	30	18	15	20	13	10
Grand Total	465	389	22	340	320	167	119	156	107	60
Percent of Defense Contractors Reporting in Each Area										
Adv Comp	21	81.0%	9.5%	85.7%	61.9%	33.3%	14.3%	38.1%	4.8%	28.6%
Batteries	24	87.5%	4.2%	83.3%	87.5%	20.8%	20.8%	54.2%	16.7%	12.5%
Power El	63	93.7%	6.3%	79.4%	82.5%	44.4%	30.2%	39.7%	23.8%	15.9%
Wireless	48	93.8%	6.3%	81.3%	75.0%	39.6%	33.3%	43.8%	27.1%	6.3%
Percent of Non-Defense Contractors Reporting in Each Area										
Adv Comp	101	81.2%	4.0%	67.3%	52.5%	34.7%	20.8%	29.7%	3.0%	17.8%
Batteries	27	63.0%	11.1%	70.4%	63.0%	37.0%	18.5%	29.6%	25.9%	7.4%
Power El	56	80.4%	1.8%	69.6%	67.9%	30.4%	25.0%	26.8%	28.6%	7.1%
Wireless	81	87.7%	3.7%	71.6%	74.1%	34.6%	25.9%	19.8%	43.2%	4.9%
Percent Totals of Defense and Non-Defense Contractors and Special Category										
DoD	156	91.0%	6.4%	81.4%	78.2%	37.8%	27.6%	42.9%	21.2%	14.1%
Non-DoD	265	81.1%	4.2%	69.4%	63.4%	34.0%	23.0%	26.0%	23.0%	10.6%
Special	44	72.7%	2.3%	65.9%	68.2%	40.9%	34.1%	45.5%	29.5%	22.7%
Grand Total	465	83.7%	4.7%	73.1%	68.8%	35.9%	25.6%	33.5%	23.0%	12.9%

Source: BIS R&D Survey Database

The graph that follows shows the differences between defense and non-defense contractors respecting integration. Most defense contractors also have sizable commercial sales, which makes isolation of the defense market very difficult. The differences in integration are, therefore, probably greater than shown.





Source: BIS R&D Survey Database

In comparing the four technologies with respect to integration parameters, more similarities are apparent than important differences. Defense contractors, for example, were almost uniformly more integrated than their commercial counterparts regardless of the technology. As for notable differences, the commercial side of batteries scored low in number of firms performing their own R&D; as a corollary, they also scored highest in contracting out R&D. Advanced composites led all others in build-to-print, while wireless broadband had the lowest ratio of firms in that area. In contrast, wireless was highest in contracting out 50 percent or more of its parts and was also the leader in performing R&D in-house and in contracting out design and engineering work.

Overall, 389 of 465 respondents perform all or some of their own R&D. Sixteen of these firms contract out most of their R&D, while another six companies outsource all of their R&D, indicating 395 firms (or 85 percent) have R&D programs. However, most of the respondents did not report R&D to be a “major” activity of their business. In fact, only about one-third of the companies indicated “research” was a “primary activity.” This could be taken to mean that the other two-thirds did not consider R&D a critical activity of their business, or they have small

programs. If taken literally, perhaps many of these companies are not engaged in any significant “research” per se, but may be focused primarily on “development.”<sup>2</sup>

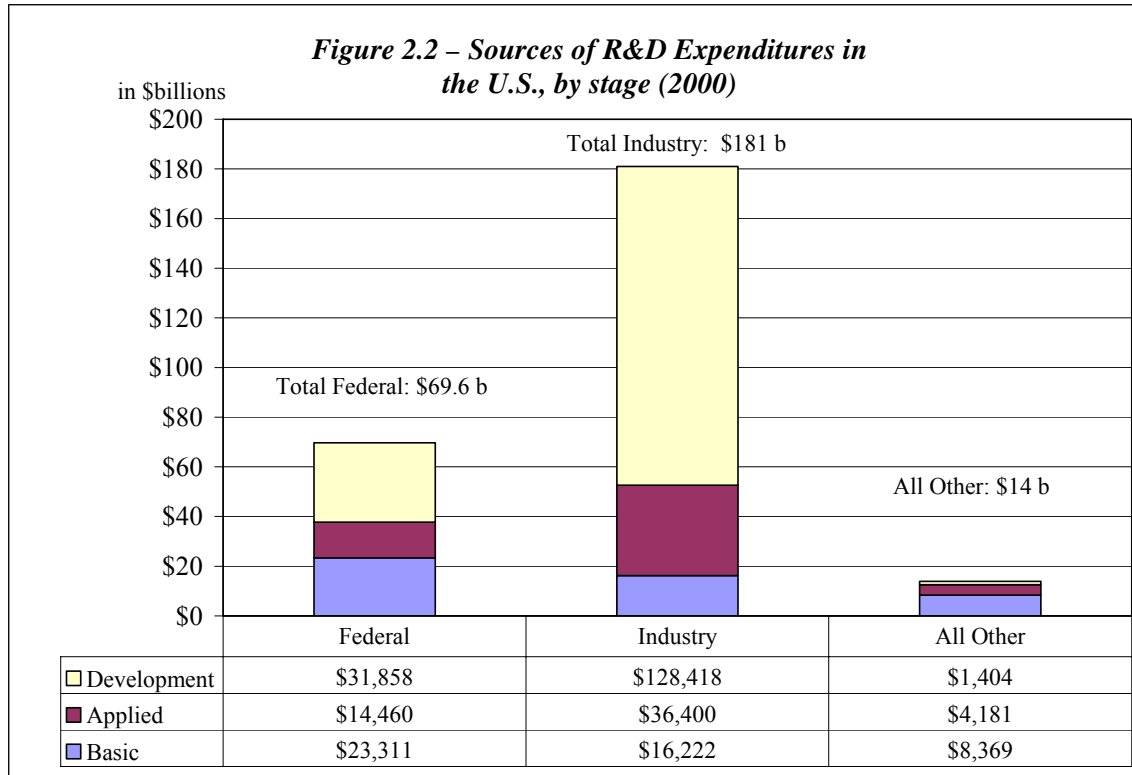
Development can also be costly relative to basic or applied research because it involves the building and testing of prototypes. Basic research is far more risky, and applied research, while less risky than basic, has a lower success rate than development. Regardless, these risks impose constraints on the use of corporate capital.

National Science Foundation (NSF) statistics show that the majority of industry’s R&D expenditures fund “development” as opposed to basic or applied research. In 2000, of the total \$265 billion spent on R&D in the United States, industry furnished \$181 billion, the federal government \$70 billion, and all others (i.e., state governments, academic institutions, and non-profit organizations), another \$14 billion. Development expenditures accounted for \$162 billion (61 percent), with \$128 billion (79 percent) contributed by industry. The federal government, primarily expenditures by the Department of Defense, supplied \$32 billion, or the bulk of the remaining 20 percent. The following graph presents the NSF data.<sup>3</sup>

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<sup>2</sup> For the purposes of this report, “research” includes basic research and applied research in the sciences and in engineering, and “development” refers to the design and development of prototype[s], products and processes.

<sup>3</sup> National Science Foundation, Division of Science Resources Studies (NSF/SRS), *National Patterns of R&D Resources: 2000 Data Update*, NSF 01-309 (Arlington, VA, March 2001). Available at: <http://www.nsf.gov/sbe/srs/nsf01309/start.htm>.



Source: BIS R&D Survey Database

Nationally, about 61 percent of the R&D was characterized as development, 21 percent as applied research, and 18 percent as basic research. The federal government supplied about 50 percent of the basic research funds, while industry supplied another third. Of the applied research, industry's share was much greater at about two-thirds of the total, while the federal government supplied about one-quarter.

## 2.4 Financial Indicators

The survey asked the companies for financial information from 1998 through 2002, with projections for 2001 and 2002. Of 471 companies returning surveys with financial information, 214 firms (about 45 percent) responded with complete statistics (i.e., five years of net sales, cost of goods sold, and net profits). The statistics were estimated upward as if all 491 firms in the respondent pool had filed complete information. Consequently, the following indicators are accurate approximations.

Estimated net sales for all sectors ranged from \$170 (1998) to \$201 billion (2000). The special category, comprising 44 respondents, accounted for about one-quarter of the sales. Non-defense contractors represented another 40 percent and defense contractors about one-third.

<b>Table 2.6 – SUMMARY INFORMATION</b> <b>Estimated Financial Indicators (\$millions)</b>							
	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001*</b>	<b>2002*</b>	<b>5-yr Total</b>	<b>5-yr Ratios</b>
<b>TOTAL NON-DEFENSE CONTRACTORS</b>							
Net Sales	\$64,414	\$67,909	\$89,633	\$79,476	\$71,936	\$373,369	100.0%
Cost of Goods Sold	\$42,673	\$45,857	\$61,370	\$62,922	\$56,809	\$269,629	72.2%
Net Income	\$3,506	\$5,059	\$5,767	-\$313	\$3,004	\$17,023	4.6%
Basic Research	\$761	\$827	\$1,079	\$1,501	\$543	\$4,711	1.3%
Applied Research	\$3,266	\$3,918	\$4,145	\$4,571	\$4,234	\$20,134	5.4%
Capital Expenditures	\$1,262	\$1,204	\$2,037	\$2,307	\$2,312	\$9,121	2.4%
<b>TOTAL DEFENSE CONTRACTORS</b>							
Net Sales	\$59,027	\$65,330	\$65,649	\$68,129	\$40,649	\$298,784	100.0%
Cost of Goods Sold	\$31,158	\$34,508	\$36,631	\$41,961	\$34,277	\$178,534	59.8%
Net Income	\$2,815	\$3,348	\$2,528	\$1,534	\$968	\$11,193	3.7%
Basic Research	\$1,432	\$1,604	\$2,091	\$2,493	\$951	\$8,570	2.9%
Applied Research	\$1,422	\$1,463	\$2,241	\$2,301	\$1,558	\$8,986	3.0%
Capital Expenditures	\$2,158	\$2,389	\$4,530	\$4,950	\$963	\$14,991	5.0%
<b>SPECIAL CATEGORY</b>							
Net Sales	\$46,851	\$44,368	\$45,407	\$47,370	\$52,588	\$236,585	100.0%
Cost of Goods Sold	\$33,484	\$33,795	\$34,082	\$35,944	\$39,921	\$177,225	74.9%
Net Income	\$2,747	\$1,790	\$2,128	\$1,615	\$2,017	\$10,298	4.4%
Basic Research	\$164	\$204	\$198	\$158	\$144	\$867	0.4%
Applied Research	\$241	\$281	\$301	\$310	\$192	\$1,325	0.6%
Capital Expenditures	\$317	\$375	\$316	\$287	\$246	\$1,542	0.7%
<b>GRAND TOTAL</b>							
Net Sales	\$170,292	\$177,608	\$200,690	\$194,975	\$165,174	\$908,739	100.0%
Cost of Goods Sold	\$107,314	\$114,160	\$132,082	\$140,826	\$131,007	\$625,389	68.8%
Net Income	\$9,069	\$10,197	\$10,423	\$2,836	\$5,990	\$38,515	4.2%
Basic Research	\$2,357	\$2,634	\$3,367	\$4,152	\$1,638	\$14,148	1.6%
Applied Research	\$4,929	\$5,662	\$6,686	\$7,183	\$5,984	\$30,445	3.4%
Capital Expenditures	\$3,737	\$3,968	\$6,883	\$7,545	\$3,520	\$25,654	2.8%

\*Estimated from projections by respondents

Source: BIS R&D Survey Database

For the survey respondents, the cost of goods sold averaged 69 percent of net sales. It was highest for the special category at 75 percent and lowest for the defense contractors at 60 percent. The non-defense group averaged about 72 percent. The defense power electronics sector recorded a low 52.6 percent and was primarily responsible for the lower overall level attributable to the defense group. In the defense group, wireless broadband contractors registered 75 percent and advanced composites 78 percent. In the non-defense group, power electronics was highest at 80 percent and wireless lowest at 59 percent – perhaps coincidentally, just the opposite values for defense contractors.

Net income (profits) averaged 4.2 percent. As a group, defense contractors averaged 3.7 percent, while profits for firms in the special category were 4.4 percent and 4.6 percent for non-defense contractors. In the defense group, losses were reported by the battery sector in four of the five years and in one year by the wireless broadband sector. During the five years (1998-2002)

defense battery contractors reported an overall loss of 2.6 percent. In the non-defense group the battery and power electronics sectors each reported losses in 1998. Wireless broadband suffered major losses in 2001 and 2002 due to collapsing sales. The advanced composites sector achieved the highest return for the five years at 6.5 percent. The sector includes a number of plastic polymer companies, many of whom are not involved solely in advanced composites.

A total of 297 firms provided research expenditure statistics, about 63 percent of the respondent pool (471). Relative to the respondent research pool, about one-third of the firms furnished data on basic research and 42 percent on applied. Overall, estimated research expenditures averaged about five percent of sales during the five years 1998 to 2002. This is higher than the national average and probably indicates the emerging and highly competitive situation in these sectors, especially in the non-defense contractor sector where expenditures averaged 6.7 percent of sales (See Table 2-6).

Basic research averaged about 1.6 percent of net sales and applied research averaged 3.4 percent. The high year was 2001, when combined basic and applied research rose to an estimated \$11.3 billion. The low was \$7.3 billion in 1998. The non-defense sector accounted for one-third of the basic and two-thirds of the applied research. The defense sector represented more than 60 percent of the basic research and less than 30 percent of the applied. The special category comprised only 4.9 percent of the total research compared to 25 percent of total sales.

Among the defense contractor group, power electronics dominated the numbers, spending during the five years a total of \$13.3 billion on research; this is more than three-fourths the defense group's total. More than half the sector's total was basic research. Note also that power electronics represented more than 60 percent of the defense group's sales. Advanced composites firms spent eight percent of sales on applied research. The non-defense group was led by wireless broadband companies, which over the five-year period logged about \$17 billion in research expenditures, two-thirds of the group's total. Applied research, at \$14.8 billion, represented nearly 13 percent of the wireless sector's sales.

Capital expenditures averaged 2.8 percent of sales and totaled \$25.7 billion for the five years. The defense group accounted for nearly 60 percent of the total and the non-defense group, most of the remainder. The special category was again relatively small. As with research, power electronics again dominated the defense group and wireless broadband dominated the non-defense group.

Federal contracts and grants information were incomplete and underreported. Companies with defense contracts provided the majority of responses, as might be expected. Very few companies

reported federal grants. Statistical information was filed for the five year period. The reported statistical information for 2000-2002 is presented in the table below.

<i>Table 2.10 – Tally of Federal Contracts and Grants, 2000 to 2002</i>							
Defense Status		Total Value (\$'000)			Firms		
	Technology	2000	2001	2002	2000	2001	2002
Federal Contracts							
Unknown	Batteries		\$1,300		0	1	0
Unknown	Power El	\$22,208	\$21,213	\$20,127	1	1	1
Def	Adv Comp	\$15,900	\$6,957	\$7,302	5	6	6
Def	Batteries	\$121,444	\$139,796	\$145,803	12	12	9
Def	Power El	\$6,374,679	\$8,499,672	\$6,989,828	35	34	33
Def	Wireless	\$1,622,467	\$1,703,660	\$2,084,716	22	23	16
Non-Def	Adv Comp	\$250	\$100		1	1	0
Non-Def	Power El	\$32,167	\$38,576	\$19,682	4	5	5
Non-Def	Wireless	\$2,928	\$61	\$1,421	3	1	3
Both	Special	\$4,773,931	\$4,395,280	\$4,414,244	31	31	29
	Total	\$12,965,975	\$14,806,615	\$13,683,123	114	115	102
Federal Grants							
Def	Batteries	\$1,000	\$1,500	\$1,750	1	1	1
Def	Power El	\$9,192	\$11,770	\$7,692	6	5	5
Def	Wireless	\$808	\$746	\$750	1	1	1
Non-Def	Adv Comp	\$38	\$92		1	1	0
Non-Def	Power El	\$392	\$708	\$867	1	2	2
Non-Def	Wireless		\$2,509	\$2,500	0	2	2
Both	Special	\$10	\$10	\$310	1	1	2
	Total	\$11,440	\$17,335	\$13,869	11	13	13

Source: BIS R&D Survey Database

## PART II – DATABASE ANALYSIS

### 3. Survey Review

#### 3.1 Interpreting the Survey Responses

The survey document sought to answer questions regarding private companies' attitudes about communicating, interacting, and collaborating with the public sector and in some cases with other private sector firms. The responses are essentially a poll of companies in the database. The firms were specifically targeted based on their product and technology orientation. Their response depended, at least in part, on their specific capabilities, firm size and integration, and previous government experience. For most companies, interaction with the U.S. government was limited and represented a small proportion of their total revenues.

The BIS survey ultimately placed more emphasis on interest in and interactions with the U.S. Department of Defense, although survey responses offered some limited insight into relations with other smaller market federal government agencies and laboratories. The respondent data was separated according to the companies standing as contractors to DoD, as alluded to in the discussion above on business activities. Survey question 11 asked specifically: "Has your Business acted as a Prime or a Sub-Contractor on a DoD contract within the past five years?"

A total of 470 companies responded to this question, including 43 firms in the special category. Of the total 470, the four technologies were represented by 427 firms, of which 158 (37 percent) answered "Yes," we have contracted with DoD in the past five years, while 269 firms answered "No," we have not. The response by technology is presented in the following table.

<b>Table 3.1 – Status of Companies as Defense Contractors</b>				
<b>Technology</b>	<b># Yes</b>	<b># No</b>	<b>Total</b>	<b>Percent Yes</b>
Advanced Composites	21	102	123	17.1%
Batteries	24	27	51	47.1%
Power Electronics	65	58	123	52.8%
Wireless Broadband	48	82	130	36.9%
Four-Sector Total	158	269	427	37.0%
Specials	39	4	43	90.7%
Grand Total	197	273	470	41.9%

Source: BIS R&D Survey Database

The four technologies – advanced composites, batteries, power electronics, and wireless broadband – were bundled into a single four sector total in consideration that responses as divided into defense and non-defense contractors were for the most part similar across the technologies. The detailed responses by individual technologies, including the special category, however, are presented in tabular form in Appendix II.

## 3.2 Interpreting Factor-Rating Questions

Beginning with question 4, 22 questions in the survey were of the statement-option type, where a statement concerning an aspect of public/private interaction is made followed by a list of factors or conditions for the respondent to evaluate. The respondent evaluated each condition by selecting one of four levels of either frequency or agreement as the case might call for, and checking the appropriate level. The method we used to measure and graph these responses applied weights to the levels. For various questions, the four options formed a frequency range: not at all, slightly, moderately, and most often; or an agreement range: disagree, slightly agree, agree, and strongly agree, depending on the question's logic. Options were weighted from 0 to 1 as follows:

not at all = 0; slightly =  $1/3$ ; moderately =  $2/3$ ; and, most often = 1.

For a specific factor, these weights would be summed and then divided by the number of respondents. The result would have a percentage value from 0 to 100. For example, assume 10 companies responded to factor A as follows: 1 = not at all, 3 = slightly, 3 = moderately, and 3 = most often. The weighted sum then equals:  $[1 \times 0] + [3 \times 1/3] + [3 \times 2/3] + [3 \times 1] = 6$ . Divide this by 10 (10 companies), and the answer is 0.6 or 60 percent.

Most factor-rating questions included an "Other" option where companies were given the opportunity to list and evaluate additional factors. These are added to the parent question analysis where appropriate.

## 3.3 Written Questions

Questions 13 on page 7, 15 on page 8, and 25 on page 11 (see Survey, Appendix I) asked the survey respondents for written comments. These are summarized in sequence in the write up that follows. In addition, an itemized list of the comments, arranged by the major issues they addressed, is provided in Appendix V.

## 3.4 Yes/No Questions

Beginning with question 16, the survey contained 21 Yes/No questions. These were evaluated based on the percent of respondents that answered "Yes." Five of the Yes/No questions were actually a list of Yes/No options which could be graphed. Some of the Yes/No questions had qualifiers, for example, "No" or "No, but want to," which required additional explanation.



## 4. Research and Development Projects

### 4.1 R&D Communication with the Federal Government

Questions 4 and 5 asked companies to identify the stage in their R&D processes when they communicate R&D results to non-DoD federal agencies and labs and to DoD agencies and labs.

#### 4.1.1 Non-Defense Federal Agencies and Labs

The response to question 4 regarding non-defense federal agencies was very small. Only 18 defense and 19 non-defense contractors responded, which is less than 10 percent of the companies in the database. It is difficult to make judgments based on such sparse data, except to assume that very little communication of this sort is taking place at these stages with non-DoD agencies. Reinforcing this conclusion, the weighted percentages in this frequency range for each stage in the R&D process were also very low, especially basic research discovery, which, as we know, is rarely undertaken by private firms. In fact, defense contractors scored only 8.3 percent in this stage. Non-defense contractors were less than 10 percent in every category.

The write-in category registered a high percentage for both contractor groups, but again, involved a very small sample size. Several companies listed patent applications, export licensing, FCC approvals, and EPA compliance as the stage in the R&D process when their communication occurred, which are not really the forms of communication and technology sharing of interest here. A few mentioned commercial dealings, such as with prime contractors and new product introductions. These, however, are not directly connected to federal government agencies. Others reported they do no R&D or have no experience dealing with federal agencies. The following table shows the number of responses and the weighted percentage for each category.

<i>Table 4.1 – Question 4. At what stage in the R&amp;D process does your business communicate R&amp;D results to federal agencies and labs?</i>				
R&D Process Stage	Defense Contractors		Non-Defense Contractors	
	Total Responses	Percent	Total Responses	Percent
A. Basic research discovery	16	8.3%	17	2.0%
B. Proof-of-principle	17	23.5%	17	3.9%
C. Beta-level device	17	35.3%	16	8.3%
D. Write-in Categories	18	79.6%	19	73.7%

Source: BIS R&D Survey Database

#### 4.1.2 *Defense Agencies and Labs*

The percentage of companies indicating R&D communication with specifically defense agencies and labs was again very low, especially for non-defense contractors, for whom communication approached zero percent. Of 243 non-defense contractors that responded to the basic research discovery stage, only three companies cited “most often” versus 225 that cited “not at all.” By comparison, of 142 DoD contractors that responded to the basic research discovery stage, 89 companies reported “not at all,” while just 10 reported “most often.” These responses may indicate the paucity of companies engaged in basic research.

Based on these results, relatively little R&D process communication takes place, and what does occur is concentrated among a rather small group of firms. The write-in category of communication instances included product improvements on existing contracts, performance information, design verification and reliability, specifics requested at time of RFQ, and new product announcements, all generally outside the purview of the question. As with the previous question, very few companies responded to this write-in portion. The following table presents the stage of communication with DoD agencies and labs for the categories shown.

<i>Table 4.2 – Question 5. At what stage in the R&amp;D process does your business communicate R&amp;D results to DoD agencies and labs?</i>				
R&D Process Stage	Defense Contractors		Non-Defense Contractors	
	Total Responses	Percent	Total Responses	Percent
A. Basic research discovery	142	20.2%	243	3.6%
B. Proof-of-principle	145	32.4%	241	4.1%
C. Beta-level device	144	37.3%	242	4.8%
D. Write-in Categories	22	66.7%	24	19.4%

Source: BIS R&D Survey Database

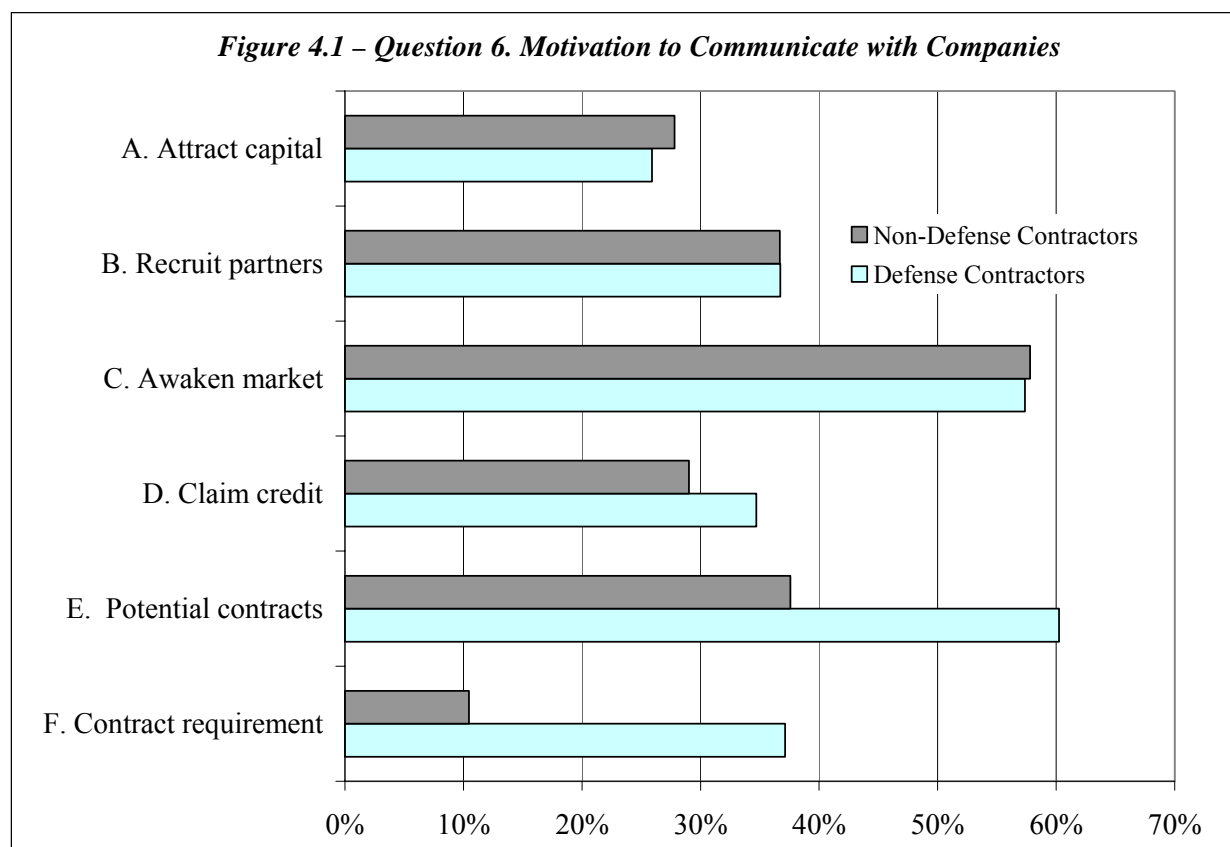
## 4.2 Factors that Motivate R&D Communication

Questions 6, 7, and 8 asked companies to identify factors that motivate them to communicate R&D programs and technology to other companies, to other federal government agencies, and to the Department of Defense, respectively.

#### 4.2.1 *Motivation to Communicate with Other Companies*

Weighing factors that motivate them to communicate information about their R&D programs and technology to other companies, defense contractors reported that the potential for landing contracts or grants represented their strongest motivational factor. This factor registered 60.2 percent on the frequency scale. Their desire to awaken the market and sensitize potential buyers

was a close second at 57.4 percent. Non-defense contractors were motivated by a desire to awaken the market, recording 57.8 percent. All other suggested motivational factors registered less than 40 percent for both groups of contractors. Write-ins were overwhelmingly related to promoting current or future sales, or to attracting new business. A few other companies noted that collaborations with other firms, resolution of performance problems, and technical marketing were also factors. However, only four defense firms and 21 non-defense contractors provided write-ins.



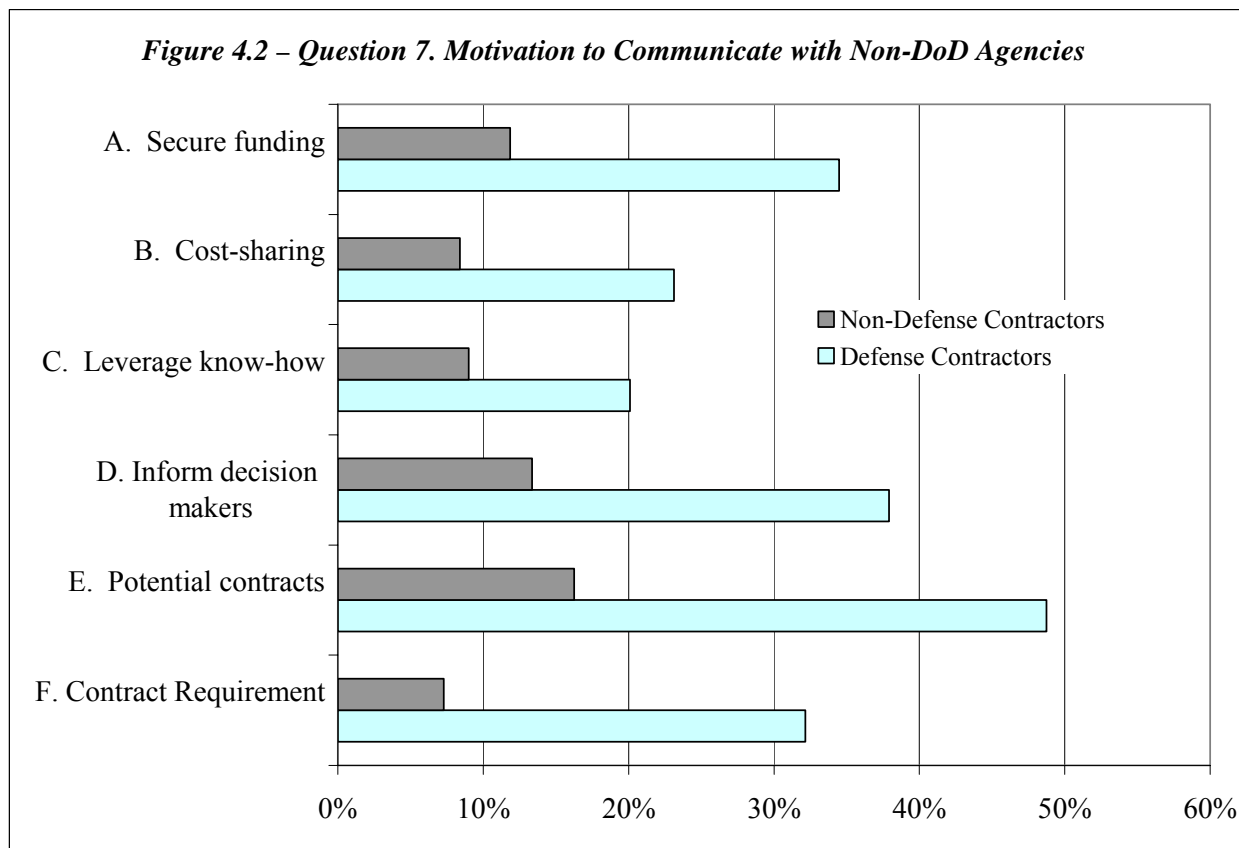
Source: BIS R&D Survey Database

#### **4.2.2 Motivation to Communicate with Non-Defense Federal Agencies**

In the case of communicating with non-defense federal agencies, no factor achieved even 50 percent, which indicates generally less involvement and experience working with non-defense agencies. The potential for winning contracts or grants was 48.7 percent for defense contractors; certainly not as strong a motivation as it was for their dealing with private companies. This may be related to the smaller size of non-defense agency R&D budgets as well as their stronger focus on other technologies than those under review here. All other factors registered a frequency of less than 40 percent. Noteworthy is the low rating of 20.1 percent tallied for leveraging federal lab know-how, and 23.1 percent for collaborating with federal labs on a cost sharing basis.

Non-defense contractors showed very little motivation toward dealing with the non-defense public sector. In fact, the highest rating was only 16.3 percent, and three of six ratings registered less than 10 percent. This low rating may in part be related to ignorance, as opposed to actual company intent, although competitive pressures in the commercial arena may also preclude their interest. Their lowest rating for motivation was only 7.3 percent, calculated for collaborating with federal labs on a cost sharing basis, for which 86 percent responded not at all.

Only 21 write-in motivations were submitted. These included patents, export licensing, and EPA compliance. These are regulatory compliance instances, which impose costs on companies faster than benefits and may influence the perception some companies have of the government. Overall, defense contractors registered about three times (32 percent) the motivational score of non-defense contractors (11 percent) toward the non-defense public sector. The following chart shows the motivational factors companies reported for non-defense federal agencies and labs.



Source: BIS R&D Survey Database

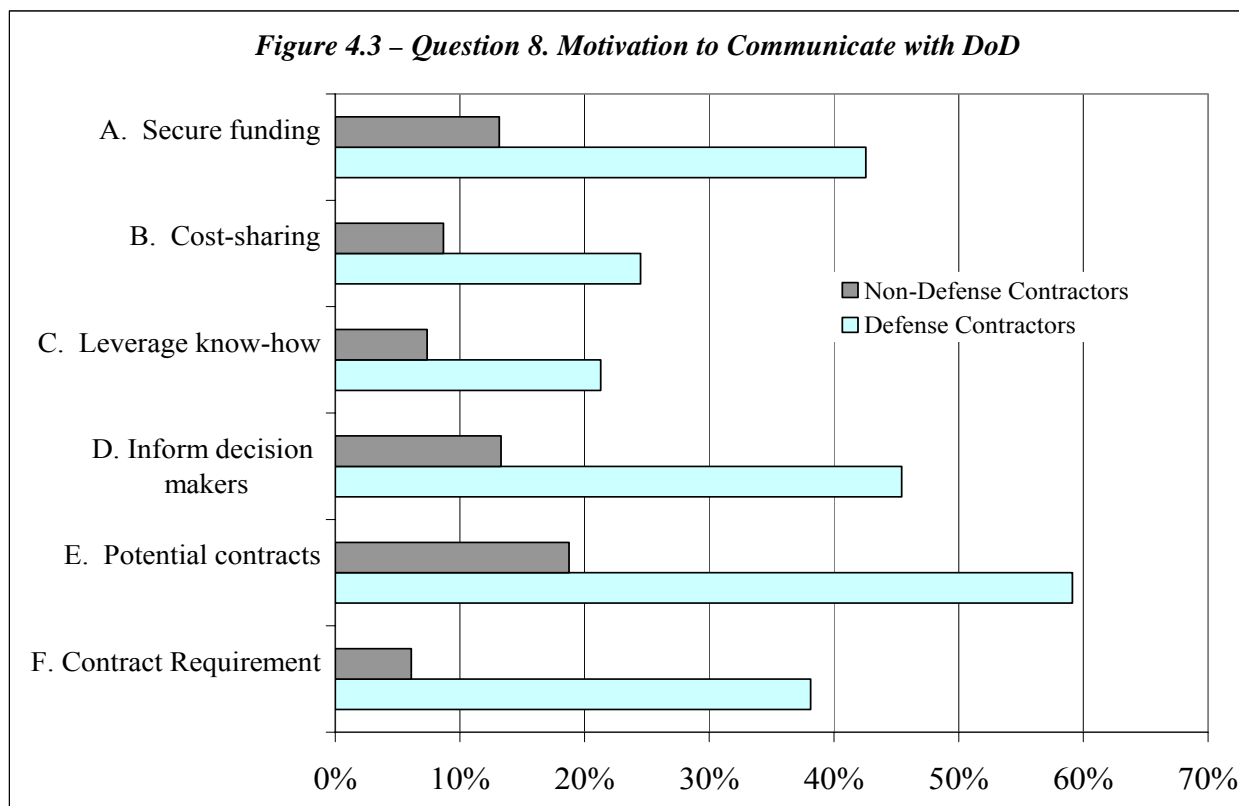
#### 4.2.3 **Motivation to Communicate with Defense Agencies**

Regarding motivations for communicating with defense agencies, defense contractors rated each of the seven listed factors at higher percentages than they had for non-defense federal

government agencies, although the average percentage of all ratings combined was still rather low at 38.6 percent. The motivational profiles between the two public entities were otherwise very similar. The potential for winning contracts or grants led all others at 59.1 percent. Only two other factors, however, were over 40 percent; these were efforts to make key DoD decision makers aware at 45.4 percent and to secure government funding at 42.6 percent.

Non-defense contractors registered much lower results, as they had with non-defense agencies. The profiles, however, were very similar. Three factors were below 10 percent, while the high was only 18.8 percent. More than 81 percent of the overall responses were not at all. These results indicate most of the non-defense contractors were unfamiliar and lacked experience with the Department of Defense.

Only 17 companies submitted write-ins, and only four of these were defense contractors. These companies cited lack of experience, lack of knowledge, and no R&D. One firm cited a joint venture in which contracts and grants are sought. The following graph displays the reported motivations that respondents felt influenced communicating R&D programs to the Department of Defense. Note the similar profile, but difference in magnitude between defense and non-defense contractors.



Source: BIS R&D Survey Database

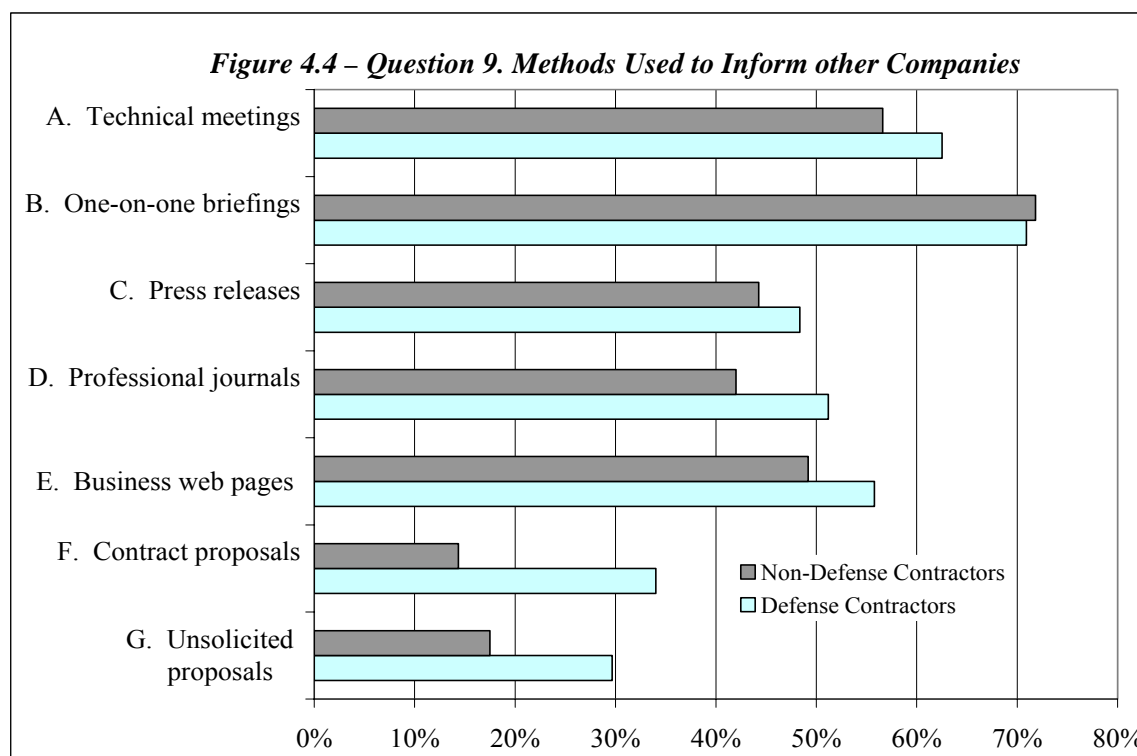
## 4.3 Methods to Inform

Questions 9, 10, and 11 asked companies to identify methods used to inform private companies, non-defense federal agencies and labs, and Defense agencies and labs of their R&D activities and technologies.

### 4.3.1 *Methods to Inform Other Companies*

Question 9 asked the companies how they inform other private companies about their R&D and technology activities. The most common method was one-on-one briefings, which comprised over 70 percent for both sets of contractors. Other significant methods included presentations at technical meetings and business web pages. The former method was 62.5 percent for DoD contractors and 56.6 percent for non-DoD contractors, while the latter methods were 55.8 percent and 49.2 percent, respectively. Defense contractors ranked fairly high both articles in professional journals (51.2 percent) and press releases (48.4 percent). Overall, DoD contractors averaged 50.4 percent for all methods compared to 42.4 percent for non-DoD contractors. More than one-third of the non-defense contractors reported not at all, compared to one-fifth of the DoD contractors.

Only 15 respondents provided write-ins. These overlapped with the given methods, but one firm mentioned using direct mail and another mentioned brochures to inform other companies. The following chart presents the preference among survey respondents for the methods used to inform other private companies of their R&D activity and technology.

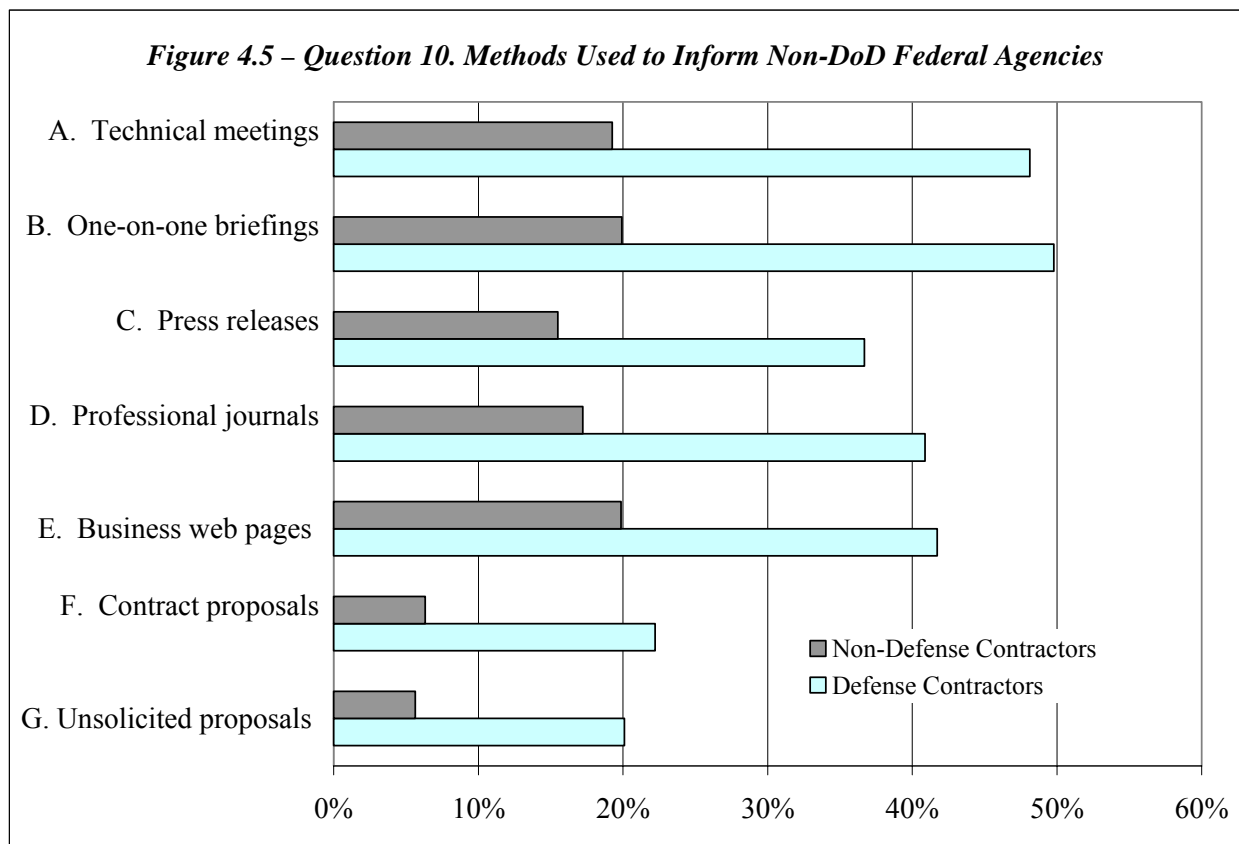


Source: BIS R&D Survey Database

### 4.3.2 *Methods to Inform Non-Defense Federal Agencies*

Question 10 asked businesses to evaluate methods used to inform non-defense federal agencies and labs of R&D activities and technologies. As an overall average, defense contractors registered only 37.2 percent for informing non-defense federal agencies and labs compared to over 50 percent they recorded for informing private companies. Non-defense contractors shrank even more registering only 15 percent compared to 42 percent for informing private companies. The highest responses recorded by defense contractors include one-on-one briefings at 49.8 percent and presentations at technical meetings at 48.1 percent. This factor profile was very similar to that of private company methods, although the magnitudes were greatly reduced. Companies with defense business are also much more likely to have business with non-defense federal agencies.

Twenty-two firms submitted write-ins, including six defense contractors. Companies reported informing federal agencies of their R&D through patent applications, filings with the FCC, and export compliance. Still others indicated they use direct mail, fax, or email. The following chart summarizes the responses to methods used to inform non-defense agencies and labs of R&D activity and technology.

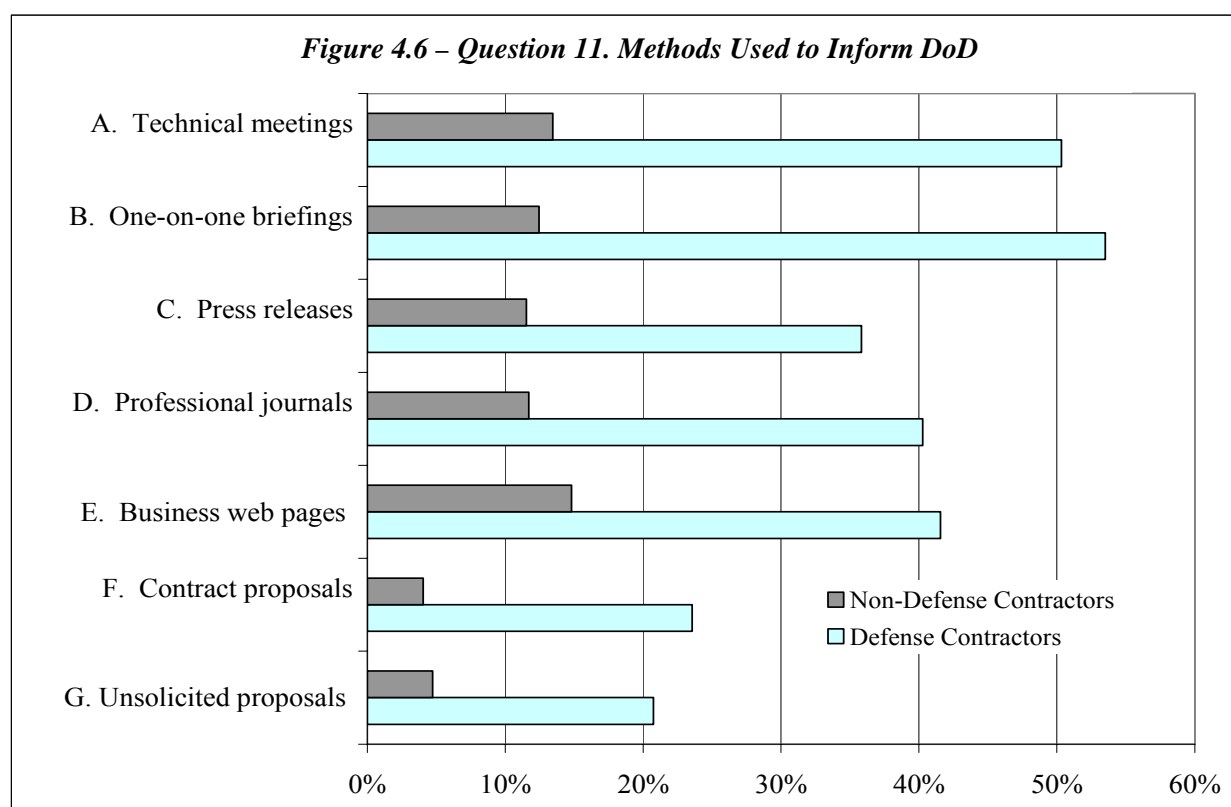


Source: BIS R&D Survey Database

### 4.3.3 *Methods to Inform Defense Agencies*

Question 11 addresses methods used by businesses to inform the Defense Department of their R&D activities and technologies. Defense contractors reported one-on-one briefings and presentations at technical meetings as both over 50 percent. Two other methods, business web pages and articles in professional journals, were over 40 percent. The profile was almost the same as that of informing non-defense federal agencies.

Over 81.2 percent of the non-DoD contractors responded not at all to the various methods, and only 3.1 percent checked most often. Very little communication appears to take place between non-defense contractors and defense agencies regarding R&D activities and technologies. Only 16 companies provided write-ins. Companies cited patent applications, filings with the FCC, and export compliance, direct mail, fax, or email. The following chart profiles the methods used to inform Defense Department agencies and labs of private R&D activities and technology.



Source: BIS R&D Survey Database

## 4.4 Reluctance to Communicate with the Public Sector

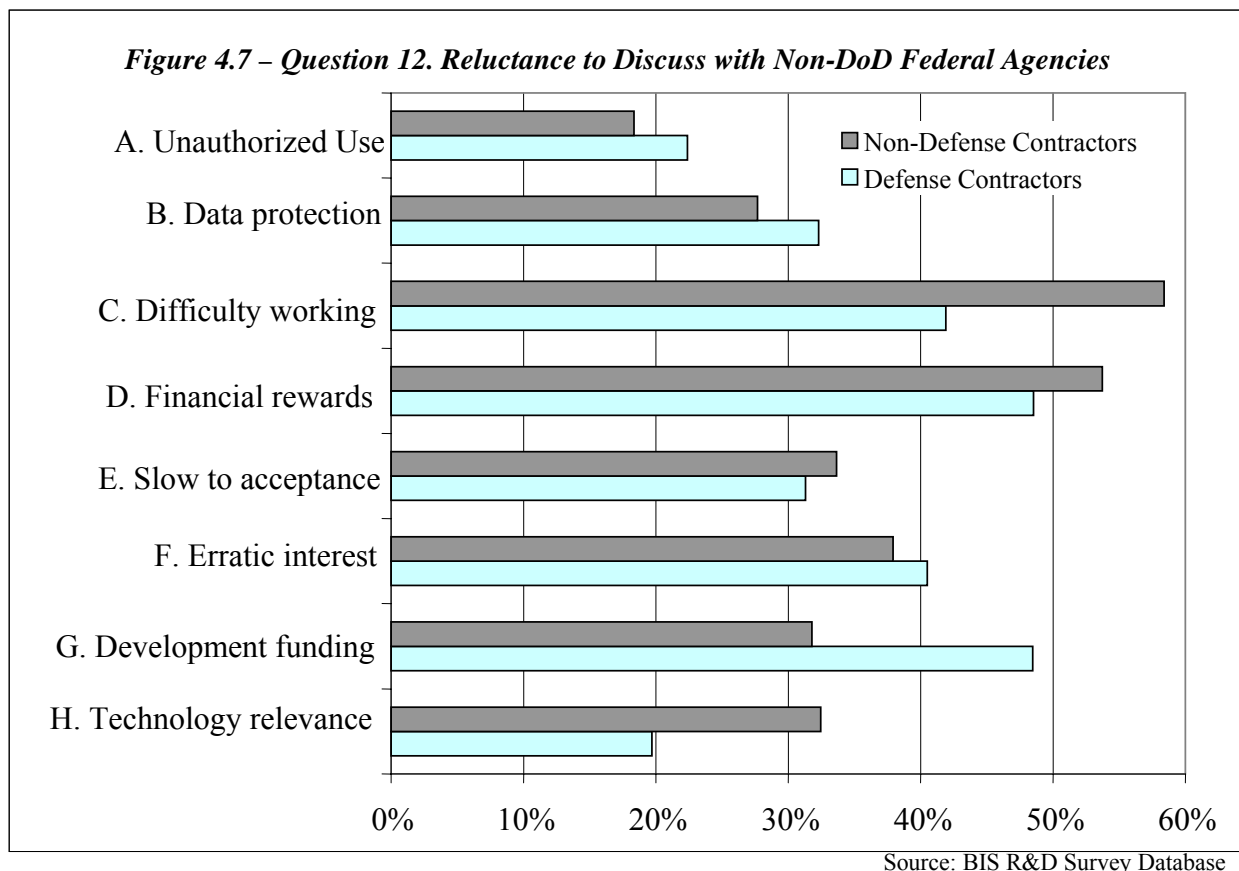
Questions 12 and 14 asked companies to identify the causes for their reluctance to discuss R&D programs and new technologies with federal agencies and labs. Companies willing to discuss their work were requested not to complete these questions.



#### 4.4.1 **Reluctance toward Non-Defense Federal Agencies**

Based on percent ranking, defense contractors indicated reluctance to discuss R&D programs and new technologies with non-defense federal agencies and labs at below 50 percent in all eight instances, which implies the absence of a strong or consistent cause for reluctance. The high of 48.5 percent was recorded by DoD contractors for two factors - working with federal agencies is too difficult and the absence of federal funds for development. The lowest value (*i.e.*, where the most respondents disagreed) was that their R&D was not applicable to non-DoD uses. As for non-DoD contractors, the most cited cause of their reluctance to discuss their technology was working with federal agencies is too difficult (58.4 percent). A close second was financial rewards are inadequate (53.7 percent). The low at 18.3 percent was that federal researchers would use their company's ideas without authorization.

Twenty write-ins indicated additional reasons for reluctance: no R&D; lack of experience; and lack of awareness. One firm noted its strong focus on consumer markets left federal agency contract work unimportant. The following chart presents a profile of the causes for some companies' reluctance to discuss their R&D programs and new technologies with non-defense federal agencies.

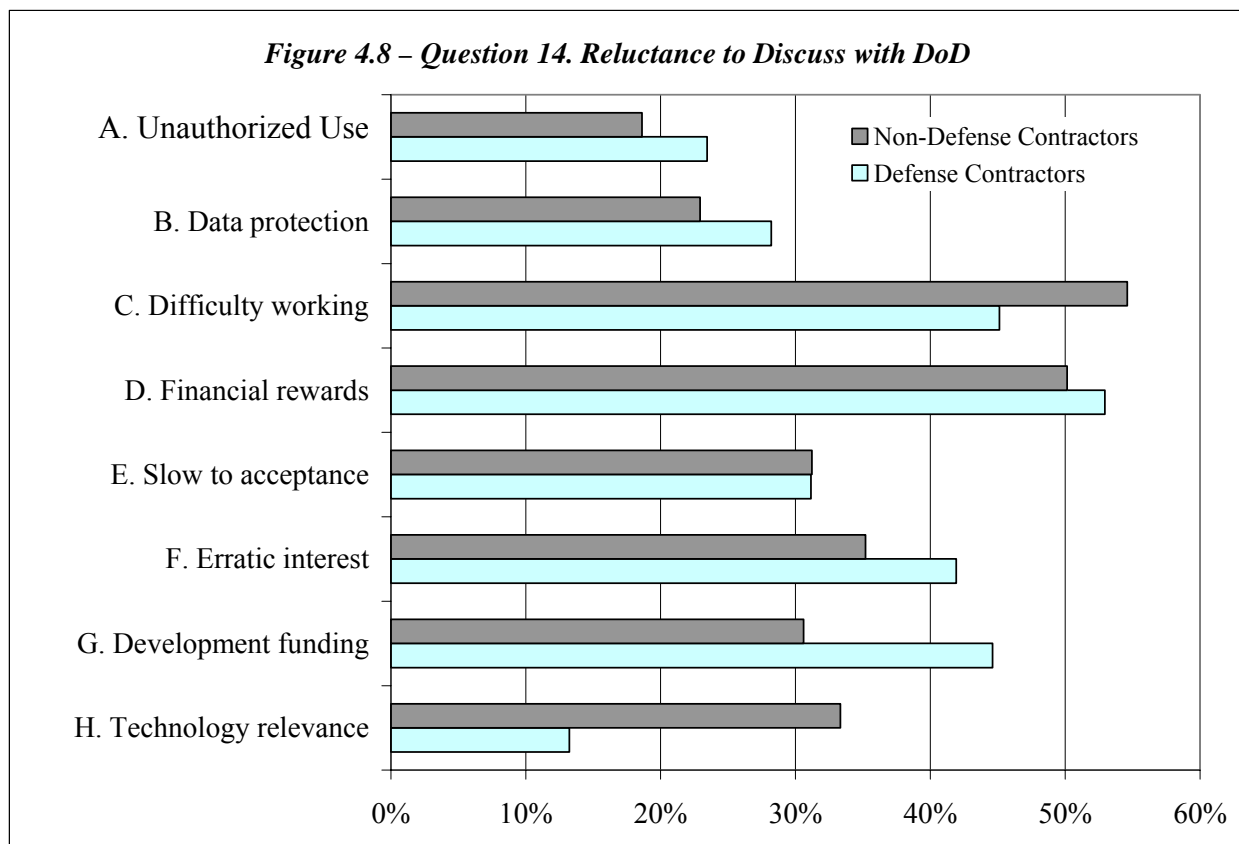


#### 4.4.2 Reluctance toward Defense Agencies

Question 14 asked firms why they were reluctant to discuss R&D programs and new technologies with Defense agencies and labs. A total of 68 defense contractors and 121 non-defense contractors responded, about 43 percent and 45 percent, respectively. The strongest response cited by DoD contractors was that the financial rewards are inadequate (52.9 percent). All other reasons were below 50 percent. The low value was that the firm's commercial technology was not useful to DoD, at only 13.2 percent.

Non-DoD contractors registered two categories more than 50 percent: working with DoD is too difficult (54.6 percent) and financial rewards are inadequate (50.1 percent). The low for non-DoD contractors was that DoD researchers would use the company's ideas without authorization, which matched the low in regard to non-DoD federal agencies. Taken altogether, the magnitudes for both sets of contractors were roughly the same, although individual factors differed somewhat.

Write-ins were submitted by 20 firms, mostly the same companies commenting on non-defense federal agencies. One foreign-owned company pointed to its home country (Japan) imposing policy limitations on its ability to take on U.S. defense work. The following chart profiles the reasons companies are reluctant to discuss R&D programs with Defense agencies and labs.



Source: BIS R&D Survey Database

## 4.5 Recommendations for Eliminating Reluctance

Companies reluctant to discuss their R&D programs with the federal government were asked to submit written comments (questions 13 and 15) recommending methods to reduce or eliminate their concerns. Question 13 was directed toward non-defense federal agencies, and question 15 toward Defense agencies. Our review of these submissions found substantial overlap. Some companies submitted multiple comments, which could be parceled into two or three different issue categories. This resulted in more comments than companies. Thus, 53 defense contractors submitted 76 comments and 71 non-defense contractors submitted 103 comments. The comments were placed into six issue categories as shown on the following table.

<b>Table 4.3 – Reluctance to Discuss R&amp;D and Technology with the Federal Agencies</b>						
	<b>Defense Contractors</b>		<b>Non-Defense Contractors</b>		<b>Combined Total</b>	
Major Issues	Responses	Percent	Responses	Percent	Responses	Percent
Procurement Complexity	32	60.4%	25	35.2%	56	45.2%
Financial Incentives	18	34.0%	14	19.7%	33	26.6%
Communications	5	9.4%	27	38.0%	32	25.8%
Intellectual Property	12	22.6%	12	16.9%	24	19.4%
Product Irrelevance	4	7.5%	15	21.1%	19	15.3%
Small Business	5	9.4%	10	14.1%	15	12.1%
<b>Total Companies</b>	53		71		124	

Source: BIS R&D Survey Database

The table displays the issue categories in descending order of the combined total of both types of contractors, showing procurement complexity, financial incentives, and communications as the central issues. Substantial differences in the relative weights, however, occur between defense and non-defense contractors for each issue, except perhaps for intellectual property or small business where the differences are the narrowest. The largest difference is communications. Here, only 9.4 percent of defense contractors considered communication a hindrance to discussing their R&D and/or technology with the federal government. However, 38 percent of non-defense contractors saw this as a problem. In fact, they ranked it as their number one issue. The runner-up was procurement complexity, mentioned by 35.2 percent of the non-defense contractors. Another large difference is product irrelevance. Here, only 7.5 percent of defense contractors cited the issue, while more than 21 percent of the non-defense contractors did. An itemized list of comments by basic issue for each group of contractors is provided in Appendix V.

## 4.6 Interaction with Federal Agencies

### 4.6.1 *Productivity*

Interaction with federal agencies includes discussions, sharing of information and knowledge, and potential use of the R&D product by the public sector. Interaction is differentiated from collaboration in that collaboration involves a prescribed co-development strategy between private and public labs. Collaboration is a more intensive level of public-private development than interaction implies.

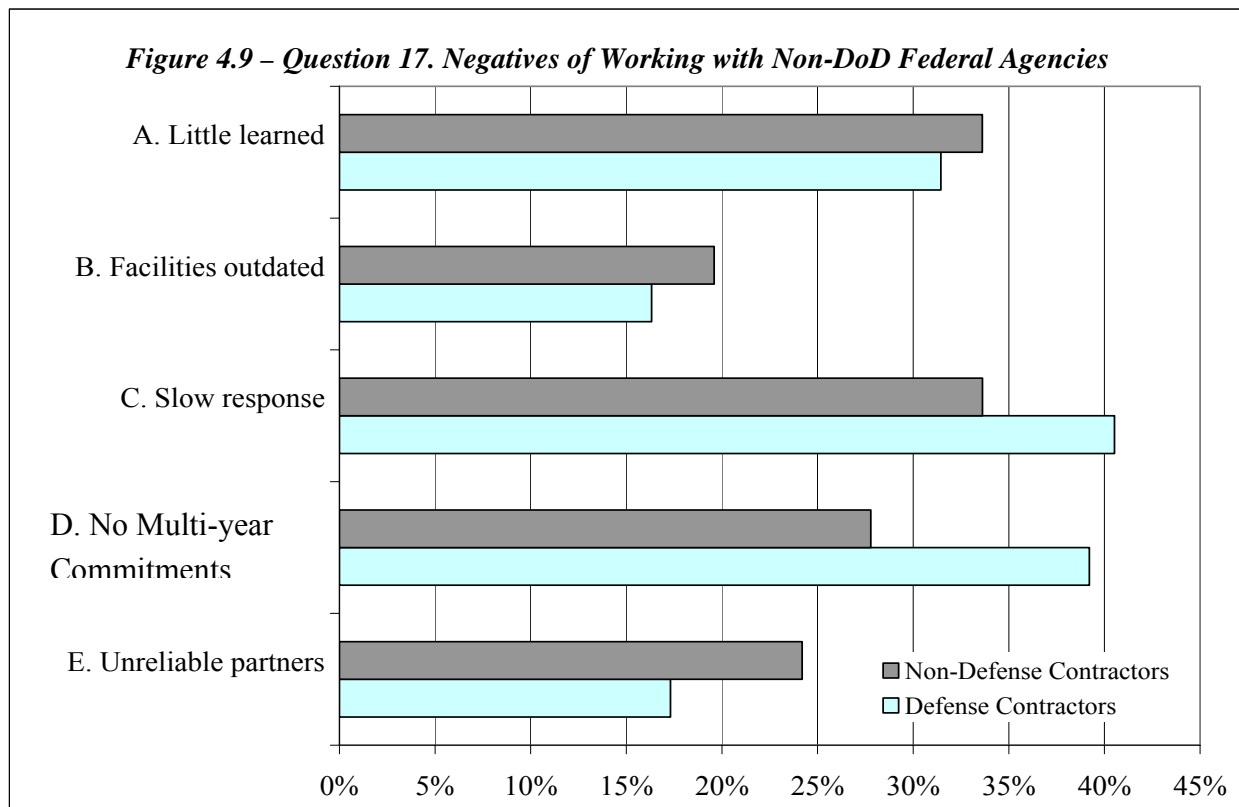
Question 16 asked companies if they found interaction with non-defense federal agencies and labs productive. A total of 141 defense contractors and 217 non-defense contractors responded. Seventy-five of the defense contractors and 62 of the non-defense contractors responded in the affirmative, and 66 defense and 155 non-defense contractors responded in the negative as shown on the following table. Companies with negative responses were asked to complete question 17, identifying reasons why working with non-defense federal agencies was unappealing.

<b><i>Table 4.4 – Question 16. Does your business find it productive to interact with non-Defense Agencies and Laboratories in performing R&amp;D, technology development, and engineering work in connection with developing new products?</i></b>				
	<b>Yes</b>	<b>No</b>	<b>Total Responses</b>	<b>Percent Yes</b>
Defense Contractors	75	66	141	53.2%
Non-Defense Contractors	62	155	217	28.6%
All Respondents	137	221	358	38.3%

Source: BIS R&D Survey Database

For question 17, the highest response score for any reason was only 40.5 percent recorded by defense contractors stating that federal researchers are slow to respond and complete work. Non-defense contractors recorded only 33.6 percent for the same reason. A close second for defense contractors was that agencies will not make multi-year contracts (39.2 percent). Non-defense contractors also recorded 33.6 percent for the factor that little is learned by interacting with federal researchers.

The write-in category included many respondents with little or no experience working with non-defense federal agencies or limited relevance to their technologies. These results are shown on the following graph.



Source: BIS R&D Survey Database

Question 18 asked companies if they found interaction with Defense agencies and labs productive. A total of 142 defense contractors and 211 non-defense contractors responded. A total of 100, or 70.4 percent of the defense contractors reported in the affirmative. However, only 23.7 percent (161) non-defense contractors responded in the affirmative. Most of the non-defense contractors that responded in the negative had no experience working with Defense agencies, at least not in developing new products. The table below shows these numbers and the percent in the affirmative.

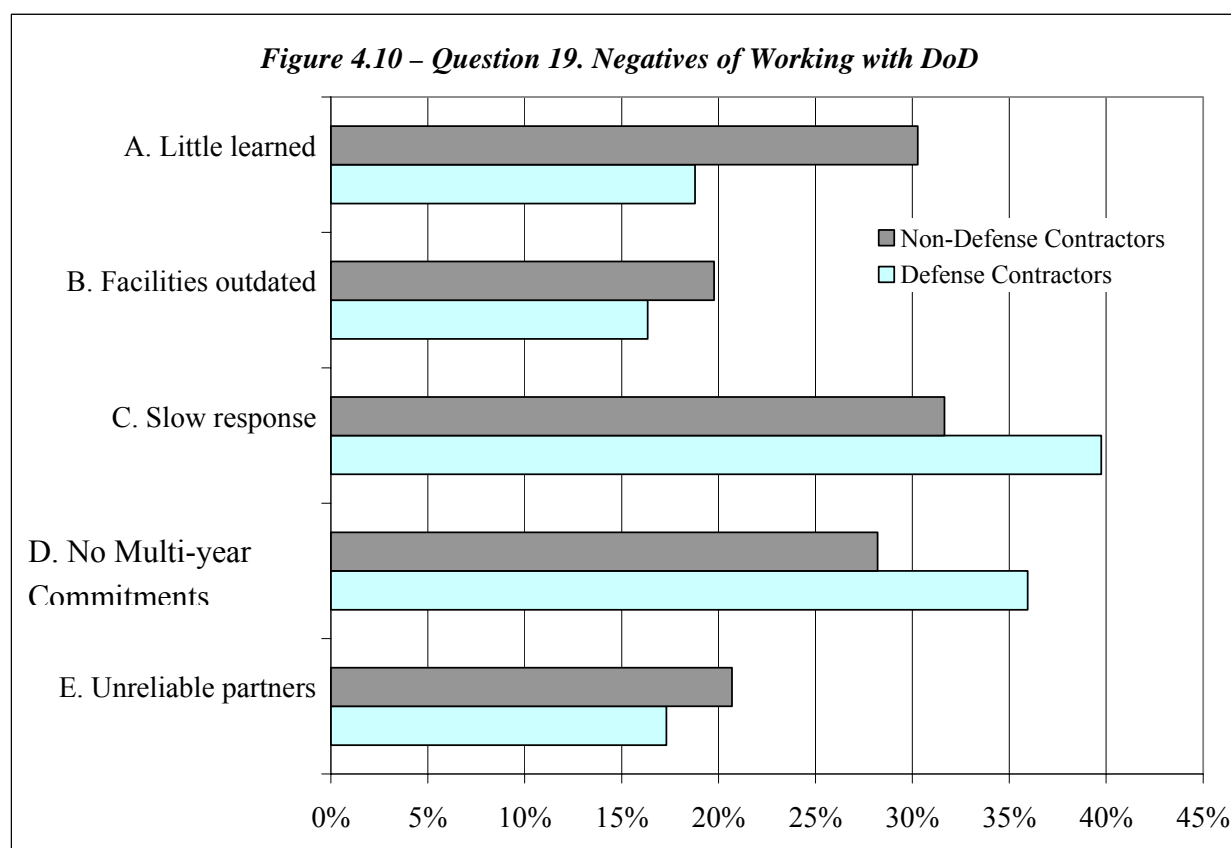
<b>Table 4.5 – Question 18. Does your firm find it productive to interact with Department of Defense agencies and labs in performing R&amp;D, technology development, and engineering work in connection with developing new products?</b>				
	Yes	No	Total Responses	Percent Yes
Defense Contractors	100	42	142	70.4%
Non-Defense Contractors	50	161	211	23.7%
All Respondents	150	203	353	42.5%

Source: BIS R&D Survey Database

Those companies responding in the negative to question 18 were asked to answer question 19, identifying reasons why they found working with Defense agencies unproductive. However, like responses to question 17 above, no single one reason dominated. The two highest values

recorded by defense contractors were that federal researchers are slow to respond and to complete work (39.7 percent) and agencies will not make multi-year contracts (35.9 percent). Note that these results are about the same as tallied for non-defense federal agencies. Non-defense contractors recorded only 31.7 percent for the explanation that federal researchers are slow to respond and to complete work and only 30.3 percent for the explanation that little is learned interacting with federal researchers.

Write-ins were similar to non-defense federal agencies' reports with a few exceptions. A Japanese-owned firm reported the Japanese government imposes limitations on interaction with the U.S. Defense Department. Another firm cited proprietary concerns and another compliance and audit issues. The following chart profiles the companies' responses to question 19.



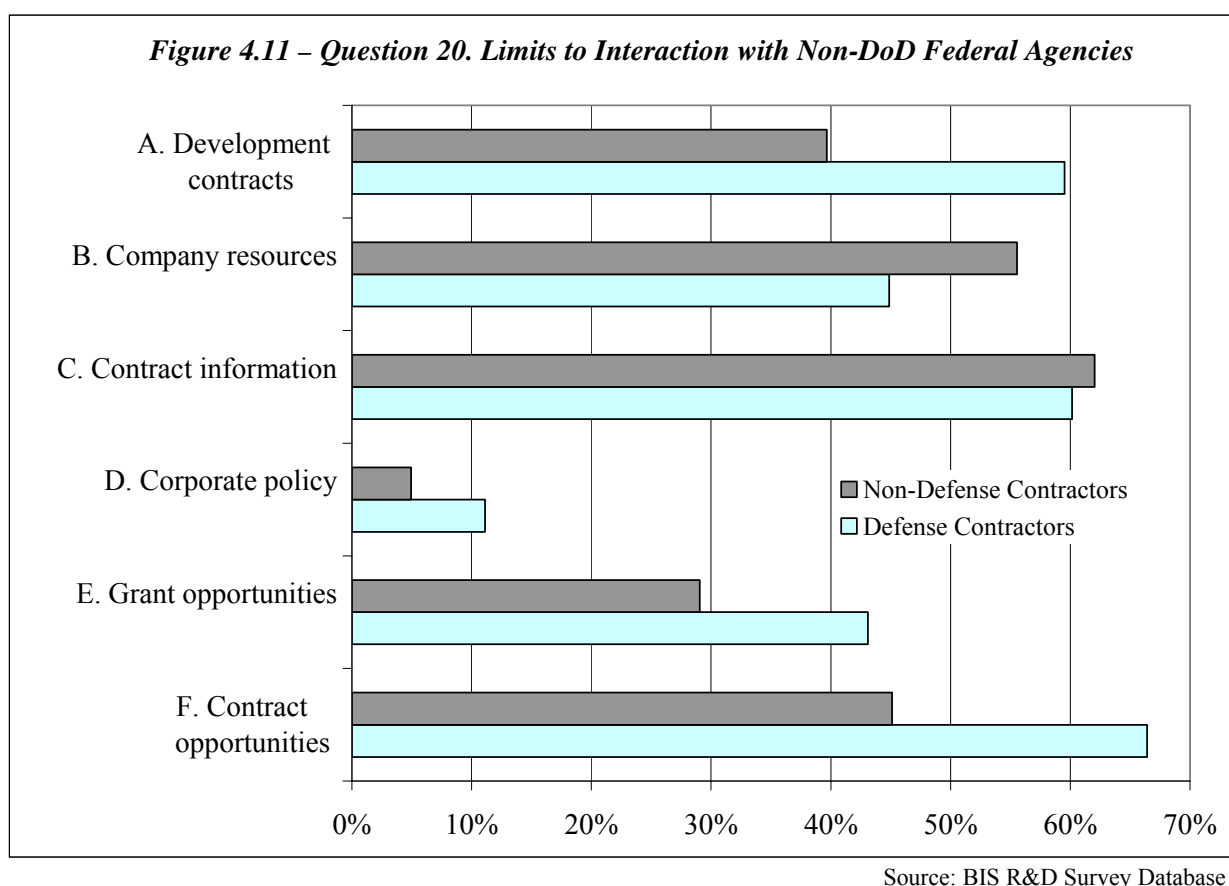
Source: BIS R&D Survey Database

#### 4.6.2 ***Limitations to Interaction***

Questions 20 and 21 asked companies to review a list of factors that might limit their interaction with non-defense federal government and Defense agencies and labs, respectively. Responding to factors that limit their interaction with non-defense federal agencies and labs, defense contractors' leading constraint was a lack of contracts (66.4 percent). This was followed by a

lack of information on contracts and R&D opportunities (60.2 percent) and limited to circumstances where a federal agency contracted the firm (59.5 percent). The lowest value was corporate policies restricting involvement (11.1 percent). Non-defense contractors cited their chief limitation as the lack of information on contracts and R&D opportunities at 62.1 percent. Second was business size and resources, which was 55.6 percent (item B on graph). Corporate policies restricting involvement registered only 4.9 percent.

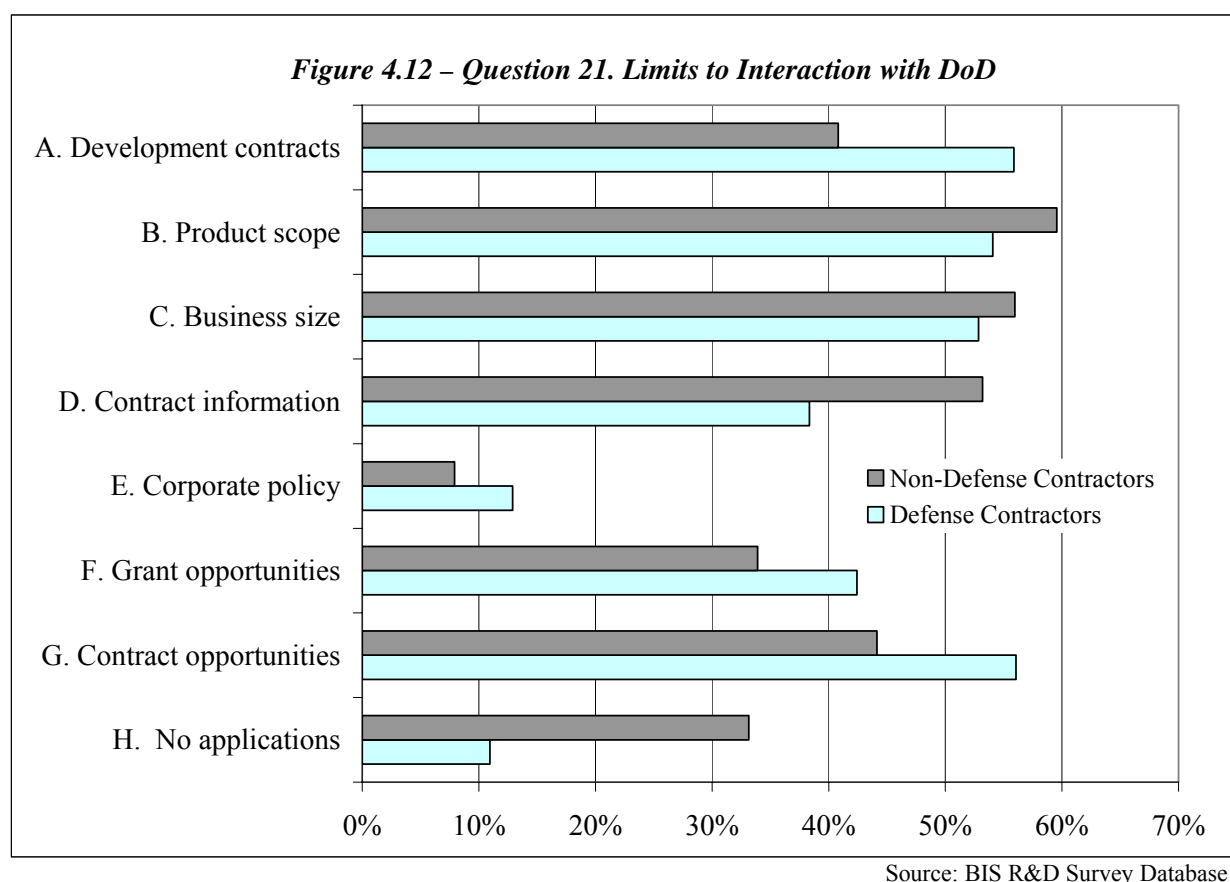
Write-ins predominantly cited lack of experience and lack of relevance. Other comments included limited opportunities, not enough volume, and compliance and audit issues. The following graph presents company responses.



Question 21 asked respondents to identify factors that limit interaction with Defense agencies and labs. Defense contractors, as they had for non-defense federal government agencies, identified lack of contracts (56.1 percent) as their leading constraint. Three other limitations scored above 50 percent. These included interaction limited to circumstances where a federal agency actually contracted with the firm (55.9 percent), to the scope of business products and services (54.1 percent), and by a lack of information on contracts and R&D opportunities (52.9 percent). Non-defense contractors cited their chief limitation as the scope of business products

and services (59.6 percent) followed by the lack of information on contracts and R&D opportunities at 56 percent. Third was business size and resources, with 53.2 percent. All other constraints for both defense and non-defense contractors were below 50 percent.

As in question 20, write-ins cited lack of experience or lack of relevance as major limitations for many firms. Comments included that commercial priorities take precedence, inadequate financial rewards, protecting proprietary information, and compliance and audit issues. The following graph presents companies' responses to limitations to their interaction with defense agencies.



## 4.7 Collaboration on R&D Programs

Questions 23 and 24 asked companies to identify areas where they seek assistance, collaboration, or contracts with federal agencies and labs. The following tables present the results for both questions.



**Table 4.6 – Question 23. Does your business confer with, seek the assistance of, collaborate with, or contract with Non-DoD agencies and labs?**

	Defense Contractors				Non-Defense Contractors			
	Responses	% Yes	% No, but want to	%Yes + %No, but want to	Responses	% Yes	% No, but want to	%Yes + %No, but want to
A. Basic for commercial	150	22.0%	19.3%	41.3%	252	11.9%	18.3%	30.2%
B. Applied for commercial	152	23.0%	30.3%	53.3%	251	12.7%	25.5%	38.2%
C. Eng./Dev. for commercial	152	22.4%	32.2%	54.6%	252	11.9%	23.4%	35.3%
D. Basic for defense use	151	15.2%	25.2%	40.4%	251	2.4%	19.9%	22.3%
E. Applied for defense use	153	24.2%	32.0%	56.2%	251	3.2%	25.1%	28.3%
F. Eng./Dev. for defense use	148	23.0%	33.1%	56.1%	250	4.4%	23.6%	28.0%

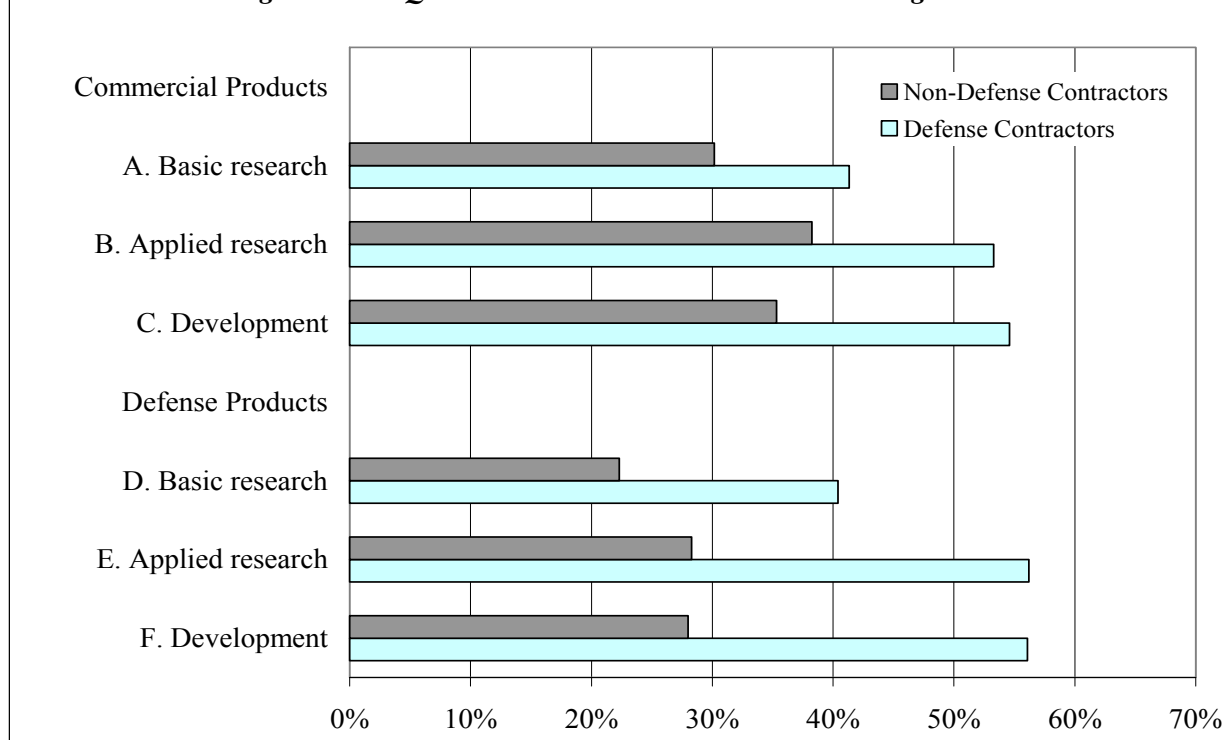
Source: BIS R&D Survey Database

Note that less than 25 percent of defense contractors responded in the affirmative in regard to non-defense federal agencies for each of the six listed stages. Thus, more than three-quarters of the companies do not confer with, or seek assistance from, the non-defense public sector at the research, engineering, or development level relating to either commercial or defense usage.

The percent that reported “no, but want to” was over 30 percent for four of the listed stages. Adding the affirmative and “no, but want to” responses together, the same four stages exceeded 50 percent. The two stages less than 50 percent were basic research relating to either commercial or defense usage. Both of these were closer to 40 percent. One possible conclusion about this difference is that collaboration in basic or applied research is more distantly pre-competitive, and in these areas, government funding may be a substitute for private funding, since private funding may be more difficult to justify.

Non-defense contractors provided affirmative responses all below 13 percent. Engineering and development related to defense products was only 2.4 percent. As expected, significantly more companies reported in the affirmative for categories related to commercial usage than for defense, although the values remain small. In addition, relatively fewer firms indicated “no, but want to,” where percentages ranged from about 18 to 26 percent. The following chart illustrates the combined affirmative and “want to” responses by contractor group.

**Figure 4.14 – Question 23. Interaction with Non-DoD Agencies**



Source: BIS R&D Survey Database

**Table 4.7 – Question 24. Does your business confer with, seek the assistance of, collaborate with, or contract with DoD agencies and labs on?**

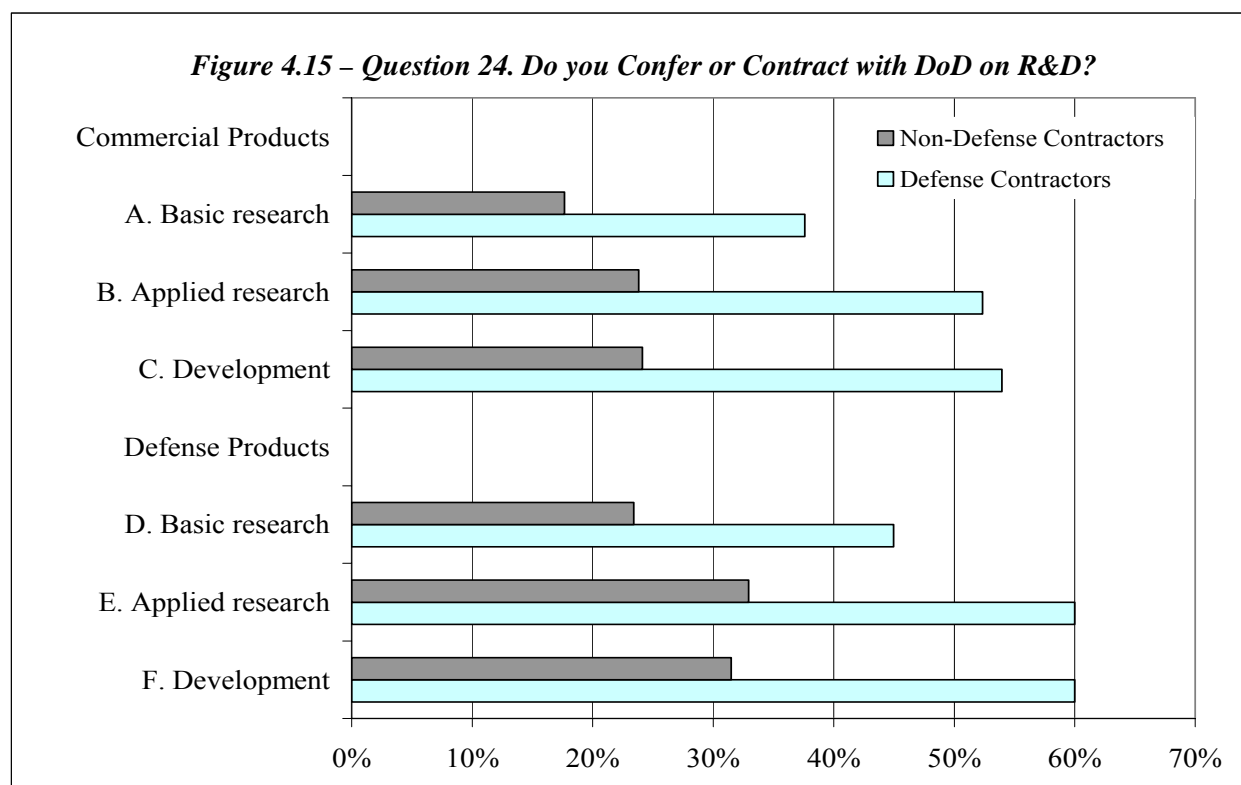
	Defense Contractors				Non-Defense Contractors			
	Responses	% Yes	% No, but want to	% Yes + %No, but want to	Responses	% Yes	% No, but want to	% Yes + %No, but want to
A. Basic for commercial	149	19.5%	18.1%	37.6%	255	2.0%	15.7%	17.6%
B. Applied for commercial	149	30.9%	21.5%	52.3%	252	3.6%	20.2%	23.8%
C. Eng./Dev. for commercial	152	29.6%	24.3%	53.9%	253	3.6%	20.6%	24.1%
D. Basic for defense use	149	18.1%	26.8%	45.0%	252	2.0%	21.4%	23.4%
E. Applied for defense use	150	30.0%	30.0%	60.0%	252	4.8%	28.2%	32.9%
F. Eng./Dev. for defense use	150	28.7%	31.3%	60.0%	254	4.7%	26.8%	31.5%

Source: BIS R&D Survey Database

Question 24 asked about collaborations with the Department of Defense. Responses were very similar for defense contractors. Most categories showed gains in the affirmative response, while responses of “no, but want to” were smaller. The combined totals were marginally down for commercial usages and up for defense.

Non-defense contractors were remarkably low in the percentages responding in the affirmative. The high was only 4.8 percent. The companies that checked “no, but want to” were also in the

minority, but a much higher proportion than the affirmatives. The following chart provides a profile of these responses.



Source: BIS R&D Survey Database

## 4.8 Recommended Changes in Government Policies

Question 25 asked companies to write in what changes in federal law, policy, operations, and program management are needed to make working with DoD organizations more attractive and productive. In all, 167 companies submitted 209 written comments in response to this question,

**Table 4.8 – Question 25. Changes needed in federal law, policy, operations, and program management to make working with DoD more attractive & productive.**

	Defense Contractors		Non-Defense Contractors		Combined Total	
	Cites	Percent	Cites	Percent	Cites	Percent
Procurement complexity	59	64.8%	37	52.1%	96	57.5%
Poor communication	16	17.6%	22	31.0%	38	22.8%
Intellectual property	16	17.6%	8	11.3%	24	14.4%
Financial incentives	13	14.3%	10	14.1%	23	13.8%
Small business	10	11.0%	7	9.9%	17	10.2%
Product differences	1	1.1%	8	11.3%	9	5.4%
<b>Total companies</b>	<b>91</b>		<b>76</b>		<b>167</b>	

Source: BIS R&D Survey Database

which were parceled into the same six major issue categories used in questions 13 and 15.

Ninety-one defense contractors submitted 115 of the comments and 71 non-defense contractors submitted 94. In addition, 52 submissions were deleted as they lacked an opinion. These were generally non-defense contractors, many with no direct contact with the federal government.

By a wide margin, more companies recommended simplification in the regulatory environment than any other issue, referred to here as procurement complexity. Almost two-thirds of defense contractors and over half of the non-defense contractors suggested changes in reference to this issue alone. The upshot of their comments is that the government market is very different from commercial practices. This difference adds to government transaction costs and may penalize companies less familiar with the process.

#### **Company A's Recommendations**

...[We suggest that the government be more proactive in pushing the information on R&D opportunities to qualified and interested contractors. This will ensure government access to very creative and productive solutions that do not reside with the established players.]

One way to accomplish this is to establish a database of all contractors and would-be contractors, along with their self-identified capabilities, resources and interests... The government then pushes the info on all new procurements compatible with a certain subset of interests and capabilities to the applicable contractors to give them the opportunity to compete for the job...

Another strategy for R&D alignment is to provide the major R&D procuring agencies with a pool of funds that can be awarded as tax credits to companies... This would push companies to tune their R&D to the government's need and toward dual-use synergies. A key aspect of this would be to avoid the cost and bureaucracy of past R&D reimbursement programs... Such a program might be ...targeted to smaller companies to accomplish the objective of fostering new and creative solutions via wider participation.

Government procurement typically treats R&D contracts as having a fixed outcome in terms of technical results and completion schedule within a certain budget. When these targets are missed - not uncommon if we are truly doing R&D - the environment is not very forgiving... We recommend that success criteria for R&D be viewed more as [statistical] distributions, and that reserves be held and allocated to worthy projects by the contracting agencies.

[Lastly, the reporting requirements and mechanisms for R&D should be streamlined, simplified, and tailored to the nature of the work.]  
...We recommend that continuous critical review and improvement efforts be maintained.

#### **Company B's Recommendations**

A fundamental problem is that the government's determination of fee/profit does not consider private investment recovery... This approach assumes the government has participated in the investment of the particular product or service on government contracts. This is not the case for privately-funded products and service, which must be offered and contracted on a "market price" basis.

Government use of commercial acquisition practices and creative investment incentives could help existing and emerging commercial companies provide competitive services to the government as well as develop new markets and compete for business worldwide. Unfortunately, the government continues to use traditional acquisition regulations and procedures when commercial products, services, practices and mechanisms are available... Consequently, much procurement that would benefit from commercial designation is not so designated, and instead is structured using more traditional acquisition procedures.

In many circumstances, commercial companies must either forgo government business opportunities or compromise their commercial business model by accepting contracts with many expensive, government-unique requirements. When a commercial company forgoes government business, the government misses the opportunity to access innovative, competitive products and services from a non-traditional government source.

Commercial practices encourage innovation and efficiency, making the U.S. industrial base more competitive by lowering costly and burdensome expenses related to non-productive government-required activities and reporting. This, in turn, frees up manpower and capital to stimulate new markets and creates incentives for the private sector to develop new technology.

A second major issue was communications. This was a more significant concern among non-defense contractors. In fact, 31 percent of the non-defense contractors thought communications between DoD and the private sector was inadequate and needed improvement. Table 4.8 presents the company responses.

Many comments were similar or the same as those made for questions 13 and 15 regarding reducing or eliminating company reluctance to discuss R&D programs with the federal government. More in-depth responses are featured as Company A and Company B recommendations. All other responses are listed in Appendix V.

## 4.9 Other Issues with Industry-Government R&D Interaction

### 4.9.1 Types of Agreements

Question 26 asked companies to identify types of agreements they had with any federal agency involving R&D conducted since 1998. Roughly 40 percent of the defense contractors have some sort of R&D agreement with the federal government. Less than 10 percent of non-defense contractors had such agreements. The predominant form of agreement was research and development contracts. About 20 percent of defense contractors were involved in CRADAs. Very few were engaged in joint ventures or technology licensing.

Most of the agreements were with the Department of Defense, although other federal government agencies were well-represented. Many companies that cited R&D agreements with DoD also cited agreements with non-DoD agencies. Write-ins mostly cited agreements with other companies. Additional write-ins cited various types of interaction with the federal government, such as supply contracts, sharing test results, and Small Business Innovation Research (SBIR). The following table reflects this information.

<b>Table 4.9 – Question 26. For the purposes of conducting R&amp;D, since 1998 has your business and <u>any</u> federal agency entered into a...</b>								
	Defense Contractors				Non-Defense Contractors			
	Yes	No	With DoD	Other Federal Agency	Yes	No	With DoD	Other Federal Agency
Joint venture	9	137	5	4	2	246	6	0
Formal Cooperative Research and Development Agreement (CRADA)	31	119	16	17	9	236	7	5
Technology license	9	139	6	4	7	240	6	4
Formal Work-for-others agreement	10	136	6	5	4	243	6	2
Other formal collaboration	13	132	7	5	1	244	6	1
R&D contract	57	93	34	25	9	239	7	5
Other	8	13	5	2	6	34	1	2

Source: BIS R&D Survey Database

Question 27 asked companies to report the number of agreements with listed federal government agencies from 1998 to 2000, and estimate those for 2001 and 2002. An “all other” category was provided for other federal agencies not specifically listed. About 3,000 agreements were reported for the five years. The most agreements were identified for 2001 (629). Agreements with the Defense Department were highest in 1998 at 470.

Defense contractors accounted for about 98 percent of the total reported agreements. Significantly, a single company accounted for about one-third of the agreements, and just 12 companies reported more than 80 percent of the total. The number of agreements provides no insight into their value.

The Department of Defense accounted for more than three-fourths of the agreements. The Department of Justice was a distant second with about eight percent. The table below shows the aggregated results of those companies that reported R&D agreements with various federal government agencies.

<b><i>Table 4.10 – Question 27. If you answered “Yes” in Question 26, please report the number of agreements with each listed federal agency.</i></b>					
	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001**</b>	<b>2002**</b>
Central Intelligence Agency	0	0	12	1	0
Department of Commerce	20	11	13	12	8
Department of Defense	470	455	383	433	421
Department of Energy	18	21	31	53	38
Department of Justice	40	42	52	53	50
Dept of Transportation	0	3	1	2	1
Environmental Protection Agency	1	2	4	5	3
Nat’l. Aeronautics & Space Admin	29	26	30	44	19
National Institutes of Health	0	0	0	0	0
National Science Foundation	2	1	4	2	2
National Security Agency	1	2	2	2	0
Other Agencies	19	26	21	22	20
Column Total – Total Agreements	600	589	553	629	562
with Defense Contractors	588	576	542	613	550
with Non-Defense Contractors	12	13	11	16	12

\*\*Estimates

Source: BIS R&D Survey Database

#### **4.9.2 Product Cycle Times**

Question 31 asked companies to identify product cycle times from R&D to marketable products. They were asked to indicate these times in years or in months as applicable to their situation. For presentation purposes, all data was converted to months. A total of 73 defense contractors (46.2 percent) and 109 non-defense contractors (40.5 percent) responded to the question. In

addition, 24 responses of 43 possible were received from companies in the special category. This special category data regarding product cycle timing is presented for comparative purposes. Average and median cycle times and standard deviations were calculated for each technology.

For the four technologies under review, 182 companies provided information on their product cycles. The average time from R&D to marketplace was 21.4 months with a median of 12 months. Companies ranged from one month to 12 years, and the standard variation was 22 months. If anything, these numbers show the technologies and products under review have highly differentiated cycles. The special category showed an average of 41.4 months, median of 36 months, and a standard deviation of 13.7 months.

The differences in average cycle times between defense contractors and non-defense contractors were significant for advanced composites and power electronics. In both cases, the average cycle times of non-defense contractors were much longer. However, only eight reports were received for advanced composite defense contractors, which could easily misconstrue the data. The average of 13.1 months is about 35 percent less than the 20-month average recorded for non-defense contractors. One firm reported 144 months as its product cycle, which was four times longer than anyone else. If this firm is removed from the aggregate calculation, the remaining non-defense contractors fall to 15 months which appears to be more reasonable. Non-defense power electronics companies showed longer cycle times than defense contractors at 26.9 months versus 21.6 months. The median for the defense contractors is 18 months, while that for non-defense contractors is 24 months.

Another method of viewing variation is to look at the middle 80 percent of the companies in terms of cycle times, thus removing extremes on either side. In this case, the middle 80 percent (146 companies) averaged 17.5 months cycle time with a standard deviation of 9.8 months. Not surprisingly, the range narrowed considerably, varying from 3 to 36 months, instead of 1 to 144 months in the larger database.

Not all of the 182 companies reported they perform research, although close to 95 percent did. About 60 percent of the firms, however, do not consider their R&D programs one of the major activities of their business. Their average cycle time was 16.7 months. The firms with research activity registered cycle times more than 26 percent higher than those without. We cannot be sure how many research firms were actually reporting their research cycle; some may have reported their development cycle, which would muddy the calculation. As such, the 26 percent is a conservative estimate. The following table provides the calculations for each technology and other factors in the discussion of product cycle times.

**Table 4.13 – Question 31. For any ongoing research related to your technology, when do you anticipate that the results of your R&D will be available in the marketplace?**  
(in number of months)

<b>Defense Contractors</b>	<b>Responses</b>	<b>Average</b>	<b>Median</b>	<b>Range</b>	<b>Variation</b>
Advanced Composites	8	13.1	9	3-36	10.6
Batteries	15	19.8	12	6-60	14.0
Power Electronics	34	21.6	18	3-120	21.7
Wireless Broadband	16	21.9	12	1-60	18.5
Total	73	20.4	12	1-120	18.8
Middle 80 percent	59	17.1	12	6-36	9.5
<b>Non-Defense Contractors</b>	<b>Responses</b>	<b>Average</b>	<b>Median</b>	<b>Range</b>	<b>Variation</b>
Advanced Composites	29	20.0	12	1-144	25.4
Batteries	14	20.6	12	2-72	18.7
Power Electronics	29	26.9	24	1-120	22.9
Wireless Broadband	37	20.5	12	1-108	24.7
Total	109	22.1	12	1-144	24.0
Middle 80 percent	87	17.7	12	3-36	10.1
<b>All Contractors</b>	<b>Responses</b>	<b>Average</b>	<b>Median</b>	<b>Range</b>	<b>Variation</b>
Advanced Composites	37	18.5	12	1-144	23.2
Batteries	29	20.2	12	2-72	16.4
Power Electronics	63	24.0	22	1-120	22.4
Wireless Broadband	53	20.9	12	1-108	23.0
Total	182	21.4	12	1-144	22.0
Middle 80 percent	146	17.5	12	3-36	9.8
<b>Special Category</b>	<b>Responses</b>	<b>Average</b>	<b>Median</b>	<b>Range</b>	<b>Variation</b>
Defense Contractors	22	43.6	36	3-120	13.4
Non-Defense Contractors	2	17.0	17	~	~
Total	24	41.4	36	3-120	13.7

Source: BIS R&D Survey Database

## 4.10 Future Alternatives: R&D Projects and DoD Database

Questions 28 and 29 asked companies about their R&D projects. Question 28 asked if the companies were currently engaged in R&D projects that might be of interest to DoD. About 55 percent of defense contractors responded to Question 28 in the affirmative. Another 21 percent indicated “perhaps, but need more information,” and 3.9 percent stated “perhaps, but do not intend to pursue.” Only 14 percent of non-defense contractors answered in the affirmative. Another 27 percent stated “perhaps, but need more information,” and nine percent stated “perhaps, but do not intend to pursue.”

Twenty percent of the defense contractors and 50 percent of the non-defense contractors responded with an unqualified no. Overall, this was about 39 percent of all companies filing surveys. Another 3.9 percent of defense contractors and 9.1 percent of the non-defense contractors do not wish to pursue the issue, although they apparently have on-going research and/or development projects. Combining these with the “unqualified no” answers indicates more



than 45 percent of the companies are unable or unwilling to share technology with DoD. These results are shown on the following table.

<b><i>Table 4.11 – Question 28. Are you currently engaged in any research and development projects that you believe might be of interest to DoD?</i></b>			
	<b>Defense Contractors</b>	<b>Non-Defense Contractors</b>	<b>All Contractors</b>
Yes	84	37	121
Perhaps, need more information	33	70	103
Perhaps, don't intend to pursue	6	24	30
No	31	132	163
<b>Total Responses</b>	<b>154</b>	<b>263</b>	<b>417</b>
% Yes	54.5%	14.1%	29.0%
% perhaps, need more information	21.4%	26.6%	24.7%
% perhaps, don't intend to pursue	3.9%	9.1%	7.2%
% No	20.1%	50.2%	39.1%

Source: BIS R&D Survey Database

#### **4.10.1 Potential DoD Database**

Question 29 asked the companies if they would be willing to place information about their R&D projects into a restricted database for use within the Department of Defense. The responses were consistent with the previous question. Among defense contractors, 96 of 142, or about two-thirds, responded in the affirmative, roughly in line with the affirmative and “perhaps, but need more information” responses from question 28.

The non-defense contractors responded with 100 affirmatives out of 244 that answered the question; a total of 41 percent. For question 28, 30 firms answered yes and another 70 said perhaps, but need more information (an aggregate also very close to 41 percent). In general, the closer a technology gets to the competitive horizon the less likely most companies are willing to share the data. This could at least partly explain the slight variation in defense contractors’ willingness to share their data between questions 28 and 29.

<b><i>Table 4.12 – Question 29. Would your company be willing to place information about its research and development projects into a restricted access database for use within DoD?</i></b>			
	<b>Defense Contractors</b>	<b>Non-Defense Contractors</b>	<b>All Contractors</b>
Yes	96	100	196
No	46	144	190
<b>Total Responses</b>	<b>142</b>	<b>244</b>	<b>386</b>
<b>Percent Yes</b>	<b>67.6%</b>	<b>41.0%</b>	<b>50.8%</b>

Source: BIS R&D Survey Database

#### **4.10.2      *Reluctance to Participate in DoD R&D Database***

Question 30 asked companies to identify reasons they would not participate in a DoD R&D database. Defense contractors' major concern affecting their decision to participate in a defense research and development database was risking loss of proprietary information. This concern scored 69.1 percent. Not far behind this concern were the following reasons: no economic benefit (66.4 percent), potential loss of competitive advantage (65.8 percent), assists competition (64.4 percent), and poorly defined awards (61.3 percent). For all 12 reasons listed, defense contractors averaged 54.7 percent.

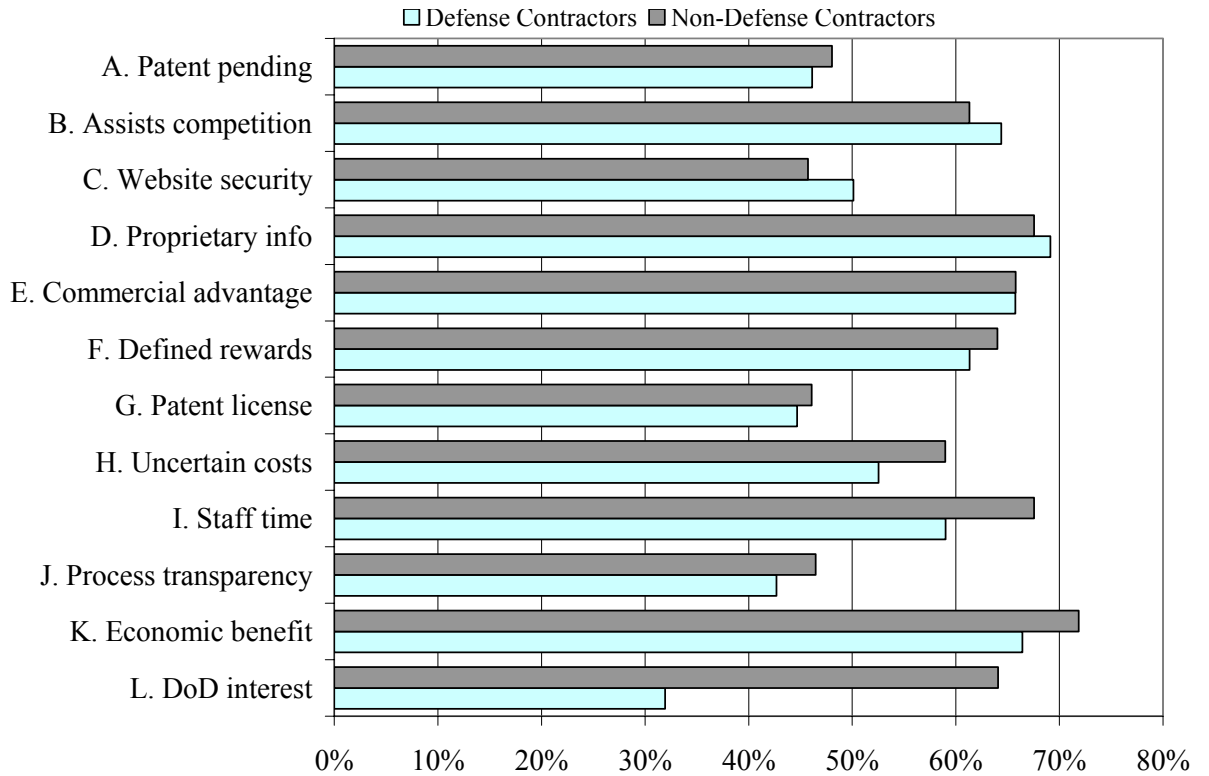
Non-defense contractors' major concern was no clear economic benefit, which logged 71.9 percent. Second was the requirement for too much staff time, followed by risking loss of proprietary information, both about 67.6 percent. The fourth reason at 65.8 percent was loss of competitive advantage. Seven of the 12 reasons recorded more than 60 percent.

It is evident that concerns for intellectual property are a big issue for both sets of firms. This is also an issue in the previous two questions and in other areas of the survey. Intellectual property relates to several reasons such as the risk of losing of proprietary information, potential loss of competitive advantage, and the risk of assisting the competition, which ranked one, three, and four for defense contractors and three, four, and seven for non-defense contractors, respectively. Economic concerns also relate to several questions in other areas of the survey. Related reasons include no clear economic benefit, poorly defined rewards, too much staff time, and uncertain costs.

Some firms indicated "no interest in DoD" as the reason for reluctance to participate in a DOD R&D database. On this point, defense contractors recorded only 31.9 percent compared to non-defense contractors with more than twice the influence at 64.1 percent. Almost half the defense contractors responded "not at all" (70 of 143) while about 20 percent of the non-defense contractors (42 of 219) did the same. At the other extreme, only 18 defense contractors (13 percent) and 92 non-defense contractors (42 percent) cited "greatly," indicating this was a significant factor in their reluctance.

This may be a reflection of differing experience levels between the two groups, which influences their perception. It may also be an accurate reflection of an underlying reality that non-defense contractors' technology generally is not relevant to defense. The following chart presents the data in graphical form.

**Figure 4.16 – Question 30. Influences on Decision not to Participate in DoD R&D**



Source: BIS R&D Survey Database



## 5. Federal Procurement and Contracting

As in the previous section, this section presents data separately for defense contractors and non-defense contractors. This section summarizes the responses to questions from Section V of the survey.

### 5.1 Federal Contracting

Responses to questions 1, 2 and 3 are presented on the following table. Question 1 asked the companies for previous experience in competing for a government contract. Almost 92 percent of defense contractors indicated they had competed for a government contract. We assume the eight percent (13 of 154) that had not competed were subcontractors to defense prime contractors and had no direct business with DoD. The majority of non-defense contractors (62.2 percent) competed for non-DoD government contracts. The great majority of defense contractors were interested in supplying the federal government, and a strong majority of non-defense contractors were interested. The same interest is evident for supplying DoD.

<i>Table 5.1 – Federal Contracting Experience and Future Willingness</i>				
	DoD Contractors		Non-DoD Contractors	
	Responses	% Yes	Responses	% Yes
1. Has your Business ever competed for a federal government contract?	154	91.6%	259	62.2%
2. Is your Business interested in becoming a supplier to the federal government?	150	94.0%	251	61.0%
3. Is your Business interested in becoming a supplier to the DoD?	86	88.4%	251	61.0%

Source: BIS R&D Survey Database

Combining the responses, the three questions illustrate a willingness to supply the federal government and/or the Department of Defense on the part of most companies. Many view the government as another business opportunity, if not for developing technology, then as a straight sale. The companies that indicated no interest might be content with their current situation or might be concerned about intellectual property, financial rewards, or regulatory complexity.

Question 4 asked the companies how aware they were of the technology capabilities of defense and non-defense government agencies. The four options were: not at all, slightly, moderately, and greatly. Responses to this question point to a general lack of awareness about government technology capabilities, even among defense contractors. Of 158 defense contractors, only 18 indicated they were greatly aware of technology capabilities within the Defense Department, and only eight were greatly aware of the capabilities within non-defense federal agencies. Non-defense contractors were even less aware, as might be expected. The majority (152 of 261) of

non-defense contractors reported that they were not at all aware of the capabilities of either defense or non-defense federal agencies.

<b>Table 5.2 – Question V-4. How aware is your Business of technology capabilities?</b>					
<b>Defense Contractors (158)</b>	<b>Not At All</b>	<b>Slightly</b>	<b>Moderately</b>	<b>Greatly</b>	<b>Percent</b>
A. Department of Defense agencies and labs	33	63	44	18	43.2%
B. Non-DoD federal agencies and labs	35	73	42	8	38.2%
<b>Non-Defense Contractors (261)</b>	<b>Not At All</b>	<b>Slightly</b>	<b>Moderately</b>	<b>Greatly</b>	<b>Percent</b>
A. Department of Defense agencies and labs	152	70	35	4	19.4%
B. Non-DoD federal agencies and labs	152	70	35	4	19.4%

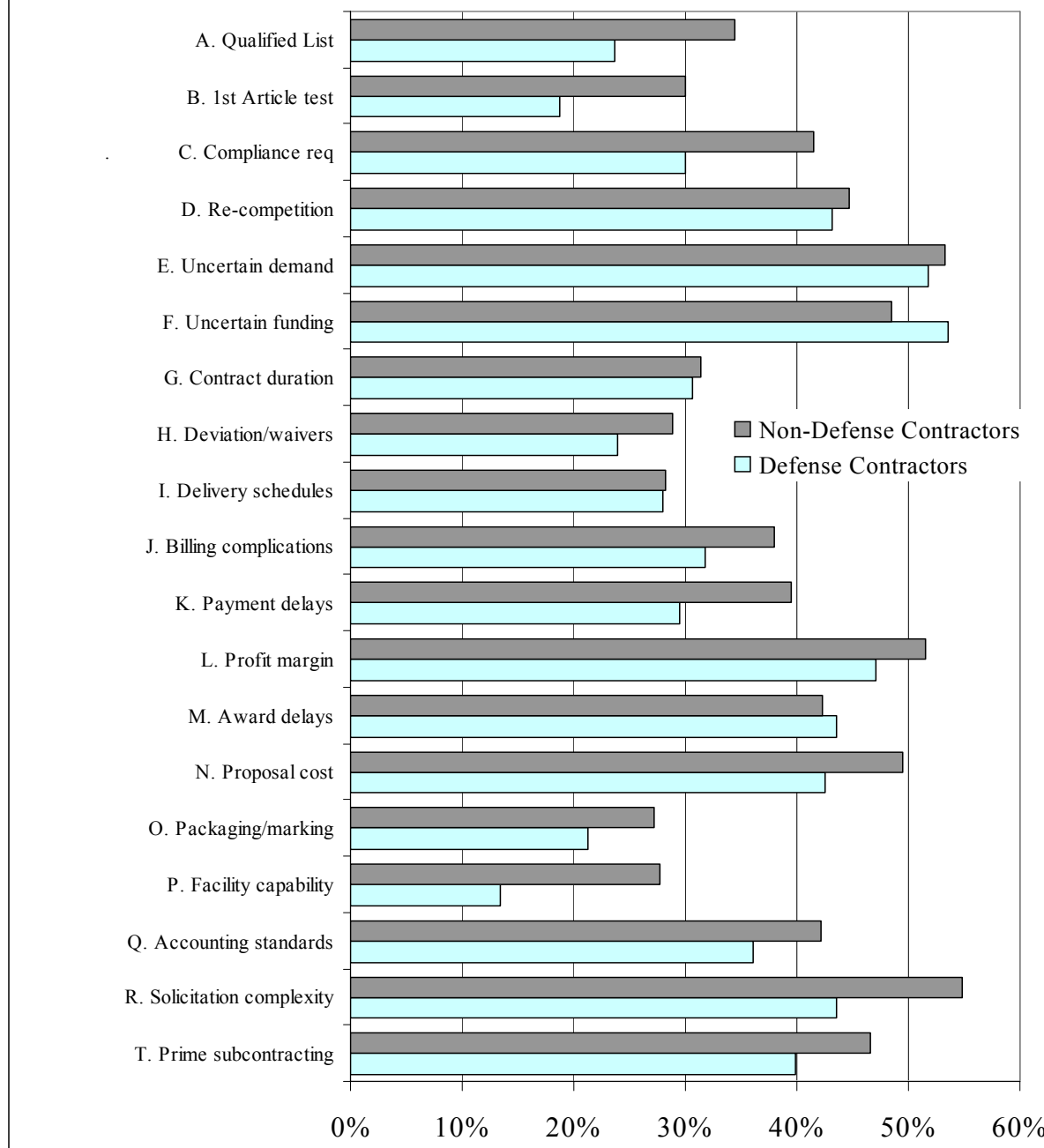
Source: BIS R&D Survey Database

## 5.2 Government Procurement Practices

Question 5 asked companies to identify government contracting and procurement practices that discourage them from seeking federal procurement opportunities (see Chart 5-7). As the chart shows, defense contractors were most concerned with the uncertainty and fluctuations of government funding (53.6 percent) and the uncertainty of government demand (51.8 percent).

Non-defense contractors were most concerned with the complexity of solicitations (54.8 percent), uncertainty of government demand (53.3 percent), and narrow payment margins (51.5 percent). Close behind were the costs of bids and proposals (49.5 percent) and uncertainty and fluctuations of government funding (48.5 percent). Write-in comments were predominantly from companies that had no experience or knowledge to make a judgment.

**Figure 5.1 – Question V-5. Government Procurement Discouragements**

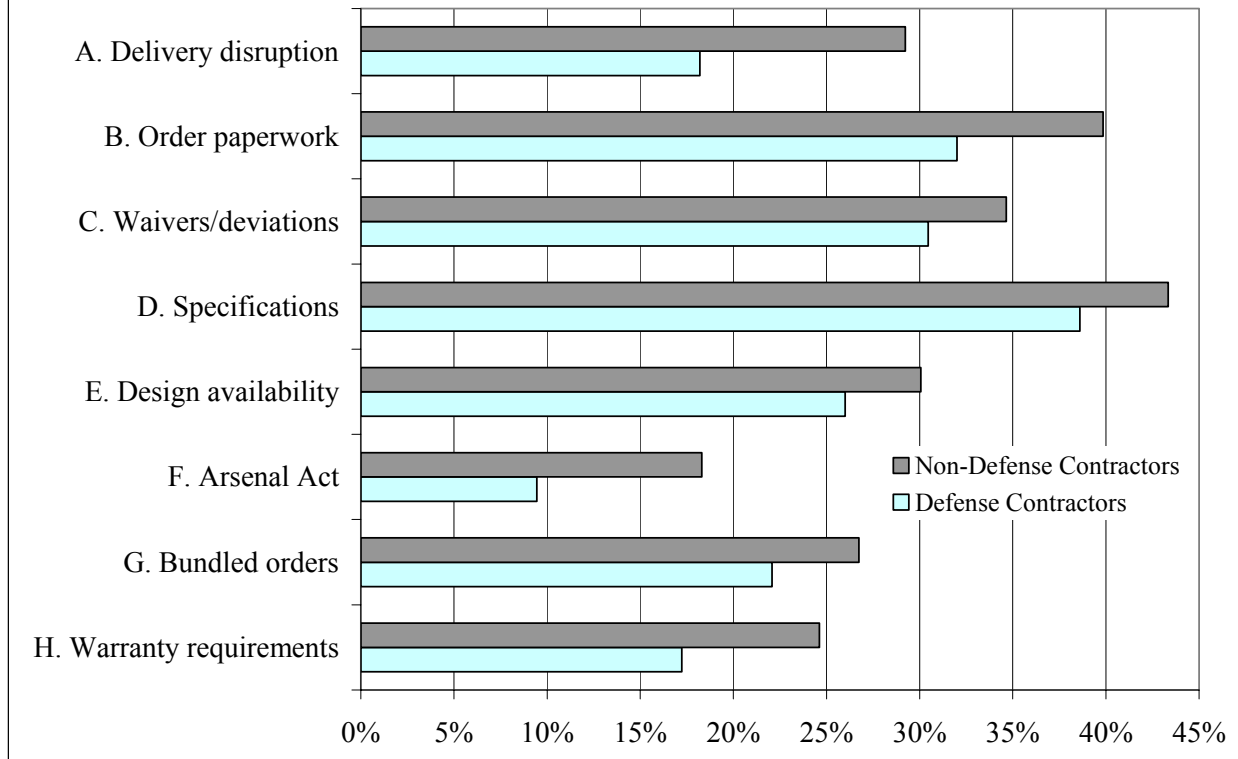


Source: BIS R&D Survey Database

### 5.3 DoD Logistics Management and the Supply Chain

Question 6 (see Figure 5-2) asked companies to identify the degree to which DoD Logistics Management practices discourage them from doing business with the Department of Defense.

**Figure 5.2 – Question V-6. DoD Logistics Management Discouragements**

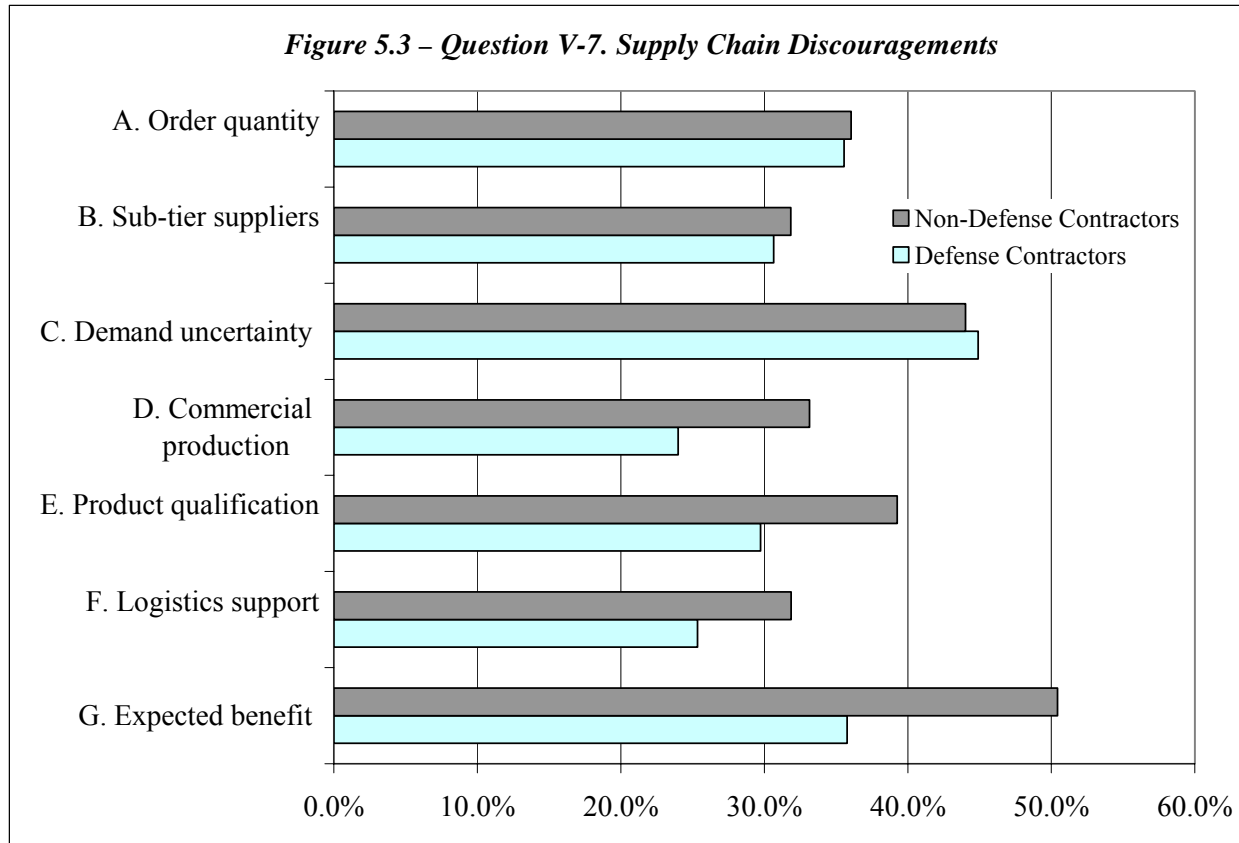


Source: BIS R&D Survey Database

The strongest concern was that specifications for defense items differ from the same commercial product. This concern was highest for non-defense contractors at only 43.4 percent. This concern was also the highest for defense contractors, but at only 38.6 percent. Non-defense contractors recorded 39.9 percent for clearance of paperwork associated with defense orders. This was also second highest for defense contractors (32 percent). Write-ins were from companies with no experience and lack of knowledge.

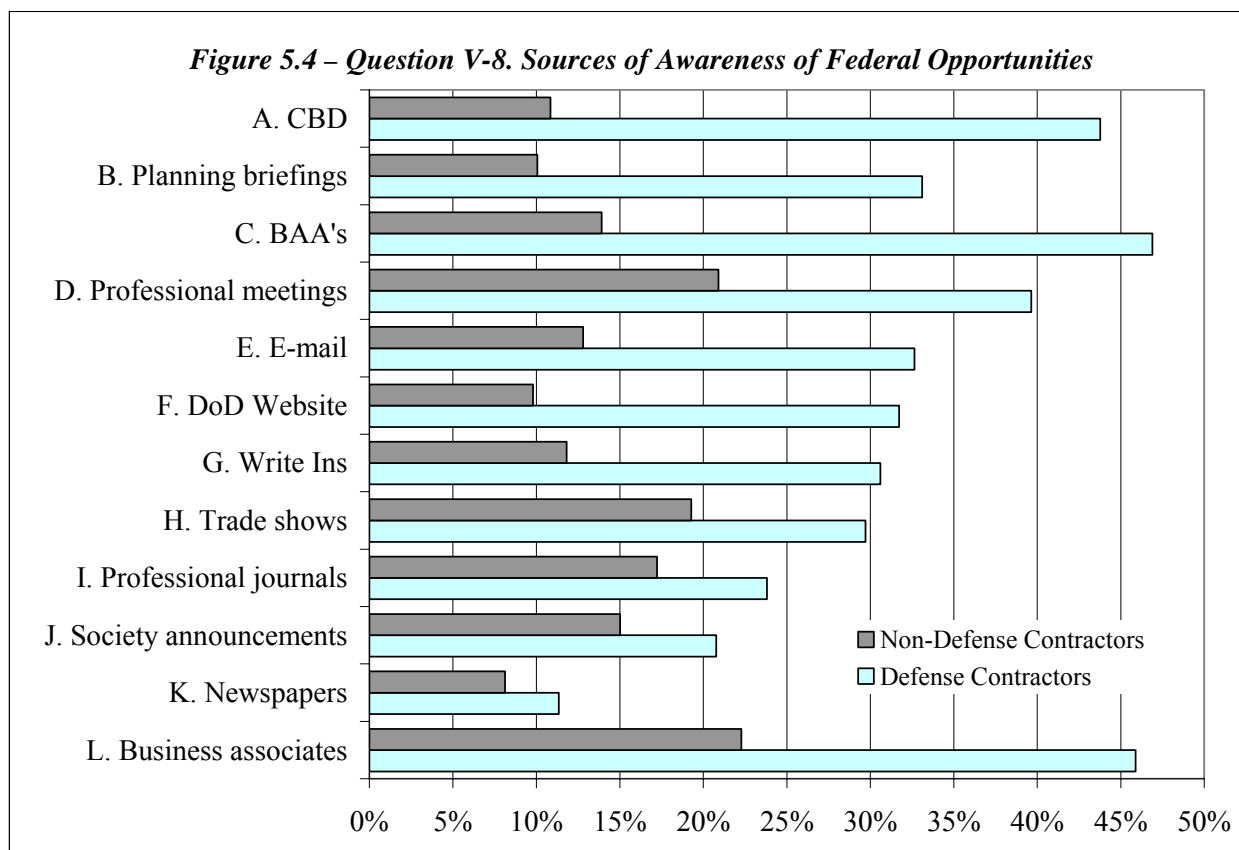
Question 7 asked companies to identify supply chain issues that discourage them from accepting or seeking Department of Defense contracts. Non-defense contractors had the strongest response at 50.4 percent, too costly for expected benefit. The only other response above 40 percent was the uncertainty of demand by both defense and non-defense contractors.





## 5.4 Awareness of Government Procurement Opportunities

Question 8 asked companies to identify how they most frequently become aware of Defense and non-defense government procurement opportunities. None of the methods, however, were particularly dominant, and all were less than 50 percent. The high was only 46.9 percent, pointing to broad agency announcements. Next was a business associate at 45.9 percent, and then Commerce Business Daily at 43.8 percent. The following chart presents the results for question 8.

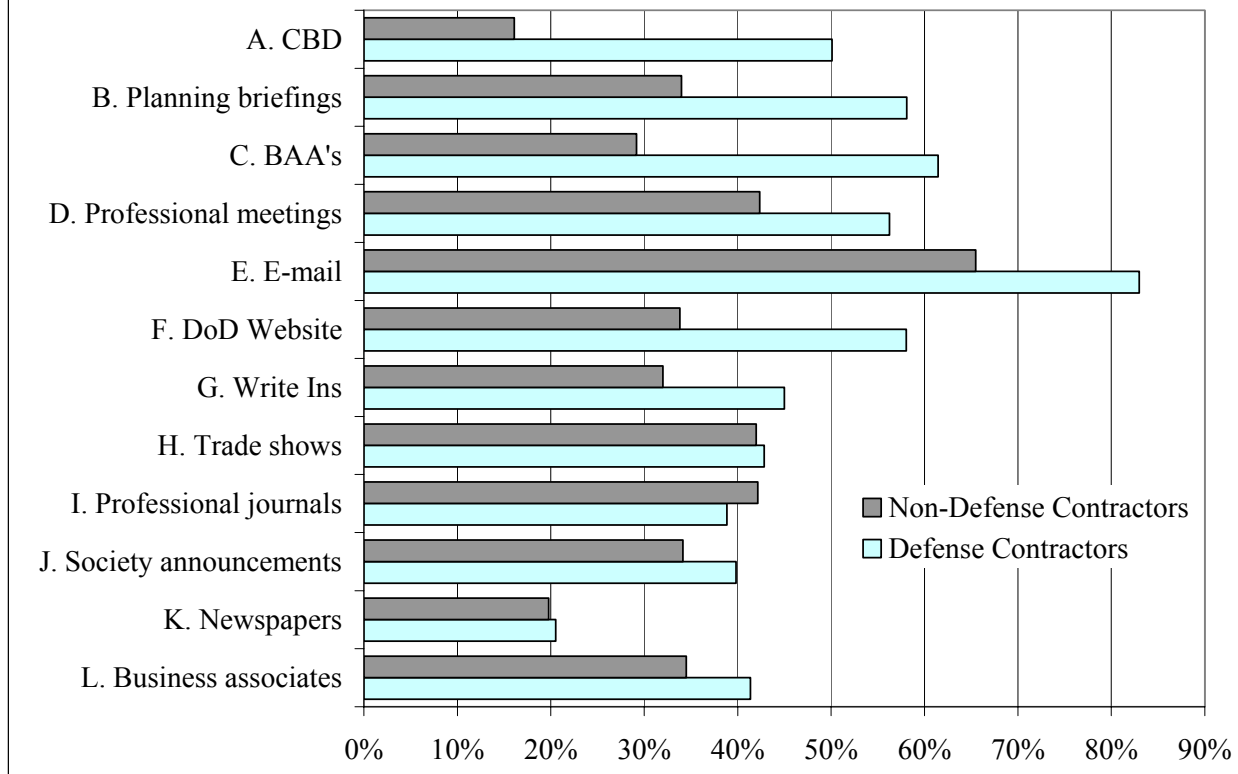


Source: BIS R&D Survey Database

Question 9 asked companies to identify the best way to inform them of Defense and non-defense government procurement opportunities. E-mail distribution was the overwhelming first choice of defense contractors and non-defense contractors alike to learn about federal procurement opportunities.

Defense contractors registered a very strong 83 percent for the method with 91 of 147 companies answering most often in their response. Non-defense contractors scored 65.5 percent. Defense contractors scored 61.5 percent for broad agency announcements and more than 50 percent for several others. Non-defense contractors registered low percentages for all other methods. About 13 defense contractors and 14 non-defense contractors submitted write-ins. These mentioned direct mail and telephone contact as additional alternatives. See figure 5.5.

**Figure 5.5 – Question V-9. Best Mechanism to Inform of Federal Opportunities**

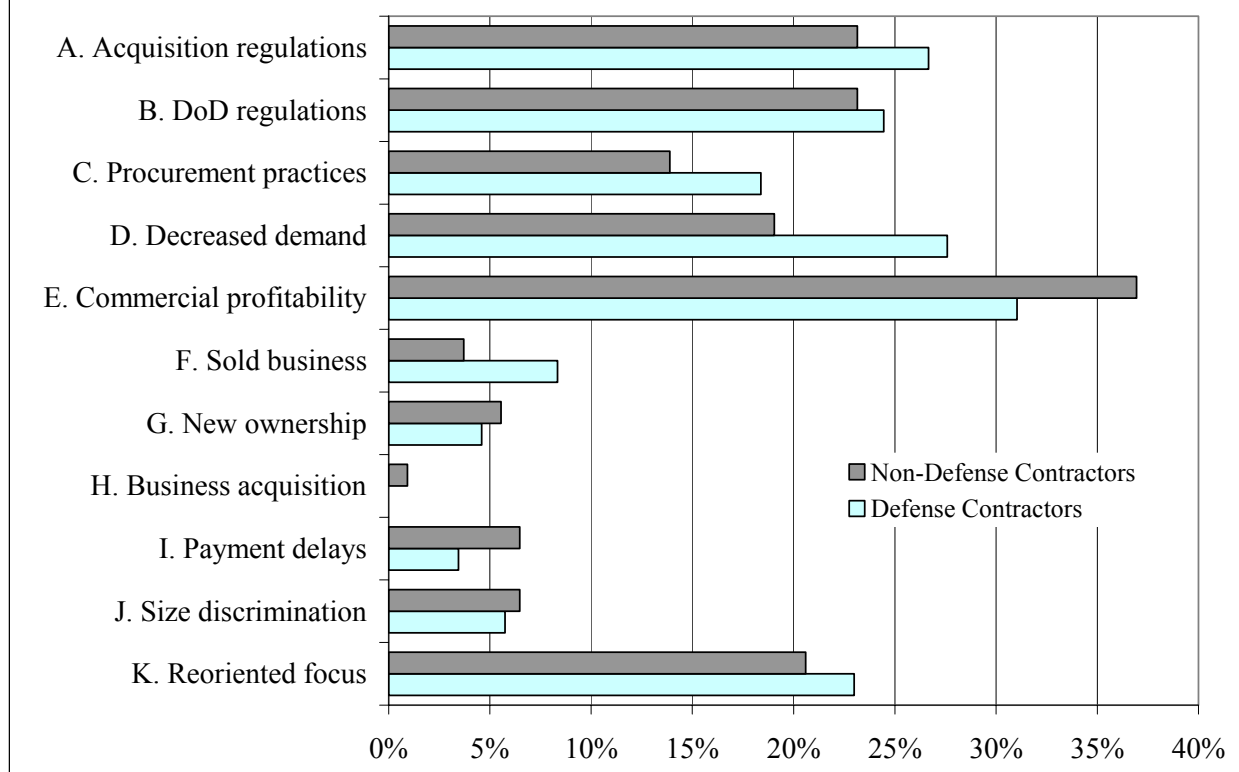


Source: BIS R&D Survey Database

## 5.5 DoD Suppliers

Question 10 asked companies to identify reasons they stopped providing goods and services to DoD since 1998. Only 29 defense contractors and 36 non-defense contractors responded to the question. While the highest percentage reason was that the commercial market was more profitable, it only registered 31 percent for defense contractors and 36.9 percent for non-defense contractors. The chart below shows these results.

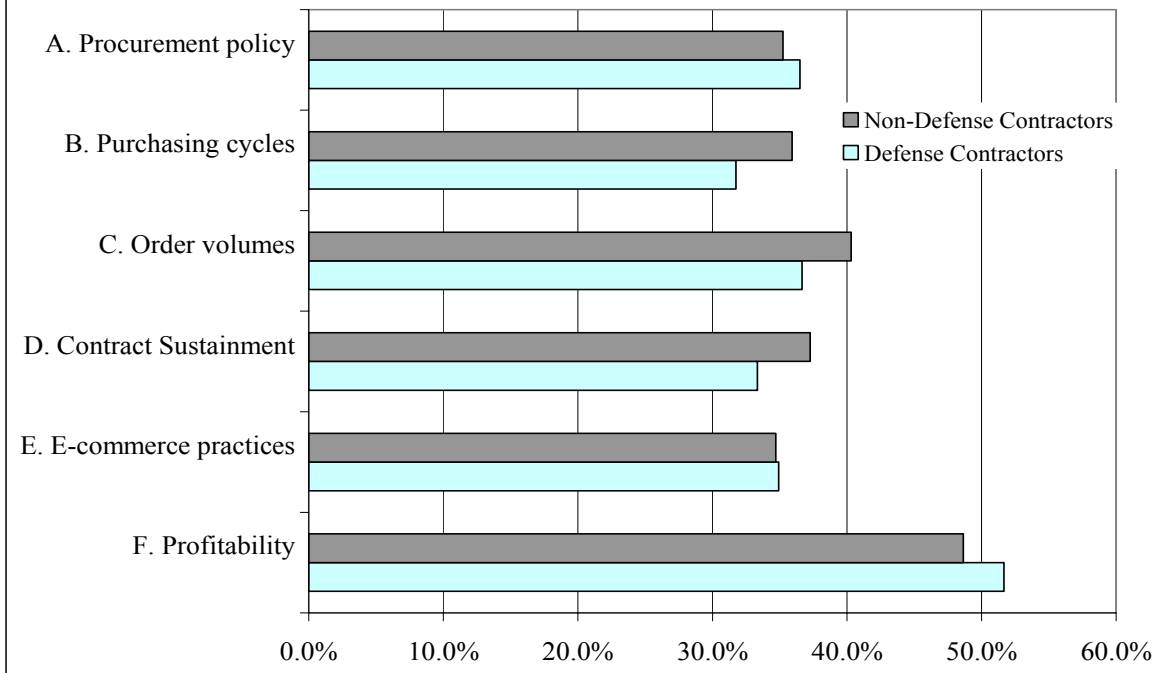
**Figure 5.6 – Question V-10. Reasons for Ending Supply to DoD**



Source: BIS R&D Survey Database

Question 20 asked companies to identify government policy changes that would motivate them to try to supply DoD on a regular basis. Only 21 defense contractors but close to 200 non-defense contractors responded to this question. Non-defense contractors were strongest in their response to fair practices in purchasing and a fair profit (listed as profitability) at 48.7 percent. This was also the strongest issue for the few defense contractors that responded. The chart presents these results.

**Figure 5.7 – Question V-20. Would Supply DoD if the Government Changed**



Source: BIS R&D Survey Database



## APPENDIX I – GENERIC SURVEY

Industry Attitudes On Collaborating With DOD In R&D  
 -- A National Security Survey of Select Business Sectors --

### I. Business identification

Provide the following information for your Business Unit:

Business Name \_\_\_\_\_  
 Street Address \_\_\_\_\_  
 City, State, ZIP \_\_\_\_\_  
 D&B Universal Numbering System (DUNS) Number \_\_\_\_\_  
 CAGE \_\_\_\_\_

SIC (3-Digit) Code(s) \_\_\_\_\_ NAICS (4-Digit) Code(s) \_\_\_\_\_  
 [Primary number(s) that this facility provides as a product or service. See the SIC and NAICS code numbers Website (<http://www.census.gov/epcd/www/naics.html>) to determine the appropriate codes.]

Parent Company Name \_\_\_\_\_  
 Headquarters Location \_\_\_\_\_  
 Street Address \_\_\_\_\_  
 City, State, ZIP \_\_\_\_\_  
 Country \_\_\_\_\_

#### 1. What is the legal status of your Business?

\_\_\_ Sole Proprietor      \_\_\_ Cooperative  
 \_\_\_ Limited Partnership      \_\_\_ Limited Liability Business  
 \_\_\_ Partnership      \_\_\_ Corporation

### II. PRODUCTS AND SERVICES

1.	What are your major business functions? [Check all that apply]			
	Importer		Fabrication	Design
	Research		Production/Manufacturing	Assembly
	Inspection		Repair and Overhaul	Integration
	Exporter		Test & Evaluation	Other (Define)
	Other (Define)		Other (Define)	Other (Define)

2. Identify your business' primary revenue contributing products (e.g., boats, cars, electronic components, etc.) and describe the nature of your business.

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## APPENDIX I

3.	<b>Does your business</b> [Check all that apply]:	
	Perform Its own R&D	Use internal company and outside D&E services
	Contract out most R&D	Use contract manufacturer(s) for 50% or more of its parts
	Create its own products	Manufacture 50% of its parts in-house
	Rely on in-house design and engineering (D&E)	Largely manufacture on a build-to-print basis, working as a contract manufacturer
	Contract out design and engineering work	Other [Please describe]

4. How long has your company made products for the [your technology] sector?  
 \_\_\_\_ Number of years

### III. Financial information

1.	For your business, please provide the following financial data for the past, current, and forthcoming accounting periods.					
Monetary Units		[Thousands (000s) of Dollars]				
YEAR		1998	1999	2000	2001*	2002*
A	Net Sales					
B	Cost of Goods Sold					
C	Net Income					
D	Revenues from Federal contracts					
E	Revenues from Federal grants					
F	Basic Research Expenditures					
G	Applied Research Expenditures					
H	Capital Expenditures on Manufacturing Process Development					

[\*Projected]

2. What percent of your fiscal year 2000 Net Sales is attributable to [your technology] related products and services? \_\_\_\_\_%



## IV. Research and Development Projects

1.	Please identify those sectors for which your business provides R&D information to private industry: (Check all applicable):						
	Thermal design		Applications		Components		Structural design
	High-temp materials		Multifunction Materials		Fabrication processes		Environmental design
	Advanced materials		Simulation Software		Mfg. Process control		Fatigue-failure analysis
	Electronic materials		Bio-inspired materials		Mold forming		Reliability /Aging
					Resins		[Other – write in]
	Fiber/Cloth		Barrier coatings				

2.	Identify those sectors for which your business provides R&D information to U.S. Government agencies (Check all applicable):						
	Thermal design		Applications		Components		Structural design
	High-temp materials		Multifunction Materials		Fabrication processes		Environmental design
	Advanced materials		Simulation Software		Mfg. Process control		Fatigue-failure analysis
	Electronic materials		Bio-inspired materials		Mold forming		Reliability /Aging
					Resins		[Other – write in]
	Fiber/Cloth		Barrier coatings				

3. Identify applicable departments and agencies that are sent your R&D information:

☐ Central Intelligence Agency   ☐ Commerce   ☐ Defense   ☐ Energy  
☐ Environmental Protection Agency   ☐ Justice   ☐ National Aeronautics & Space Admin.  
☐ National Institutes of Health   ☐ National Science Foundation  
☐ National Security Agency   ☐ Transportation   ☐ Treasury   ☐ Other

4.	At what stage in the R&D process does your business communicate R&D results to Non-Department of Defense (DOD) federal agencies and labs?	Not At All	Rarely	Moderately	Most Often
A	Basic research discovery				
B	Proof-of-principle				
C	Beta-level device				
D	Other [Identify other stages in space below]				

## APPENDIX I

5.	At what stage in the R&D process does your business communicate R&D results to Department of Defense agencies and labs?	Not At All	Rarely	Moderately	Most Often
A	Basic research discovery				
B	Proof-of-principle				
C	Beta-level device				
D	Other [Identify other stages in space below]				

6.	These factors motivate my business to communicate information about its R&D programs and technology to companies.	Not At All	Slightly	Moderately	Most Often
A	Attract capital for commercialization				
B	Recruit partners or collaborators				
C	Awaken market; sensitize potential buyers				
D	Claim credit and assert ownership				
E	Potential for landing contracts or grants				
F	Required under some grants, contracts				
G	Other [Identify other factors in space below]				

7.	These factors motivate my business to communicate information about its R&D programs and results to Non-DOD federal agencies:	Not At All	Slightly	Moderately	Most Often
A	Secure government funding				
B	Collaborate with federal labs on a cost-sharing basis				
C	Leverage federal lab know-how				
D	Make key decision makers in federal technology agencies and labs aware of the business's latest technology so it can be incorporated into new programs				
E	Potential for winning contracts or grants				
F	Required under some grants, contracts				
G	Other [List other factors below]				

8.	These factors motivate my business to communicate information about its R&D programs and results to DOD:	Not At All	Slightly	Moderately	Most Often
A	Secure government funding				
B	Collaborate with DOD labs on a cost-sharing basis				
C	Leverage DOD lab capabilities				
D	Make key decision makers in DOD technology agencies and labs aware of the business's latest technology so it can be incorporated into new DOD programs				
E	Potential for winning contracts or grants				
F	Required under some grants, contracts				
G	Other [List other factors below]				

9.	My business uses these methods to inform other companies of its R&D activities and technologies:	Not At All	Rarely	Moderately	Most Often
A	Presentations at technical meetings				
B	One-on-one briefings				
C	Press releases				
D	Articles in professional journals				
E	Business web pages				
F	Research contract proposals				
G	Unsolicited proposals				
H	Other [List other factors below]				

10.	My business uses the following methods to inform Non-DOD federal agencies and labs of its R&D activities and technologies:	Not At All	Rarely	Moderately	Most Often
A	Presentations at technical meetings				
B	One-on-one briefings				
C	Press releases				
D	Articles in professional journals				
E	Business web pages				
F	Unsolicited proposals				
G	Grant proposals				
H	Other [List other factors below]				

## APPENDIX I

11.	My business uses the following methods to inform DOD and labs of its R&D activities and technologies:	Not At All	Rarely	Moderately	Most Often
A	Presentations at technical meetings				
B	One-on-one briefings				
C	Press releases				
D	Articles in professional journals				
E	Business web pages				
F	Unsolicited proposals				
G	Grant proposals				
H	Other [List other factors below]				

12.	My business is reluctant to discuss its R&D programs and new technologies with Non-DOD government agencies and labs because... [Do not complete if your business will discuss its work.]	Disagree	Slightly Agree	Agree	Strongly Agree
A	Federal researchers appropriate my company's ideas				
B	Agencies fail to protect proprietary data				
C	Working with government R&D agencies is too difficult				
D	Financial rewards are inadequate				
E	Government managers slow to accept, understand and embrace new technology				
F	Agency interest is erratic				
G	Absence of federal funds for development				
H	My R&D not applicable to Non-DOD uses				
I	Other [Identify other factors in space below]				

13. What could be done to eliminate or to reduce the concerns listed above [Explain]?

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14.	My business is reluctant to discuss its R&D programs and new technologies with DOD agencies and labs because... [Do not complete if your business will discuss its work.]	Disagree	Slightly Agree	Agree	Strongly Agree
A	DOD researchers appropriate my company's ideas				
B	DOD fails to protect proprietary data				
C	Working with DOD R&D agencies is too difficult				
D	Financial rewards are inadequate				
E	DOD government managers slow to accept, understand and embrace new technology?				
F	DOD agency interest is erratic				
G	Absence of DOD funds for development				
H	Commercial technology not useful to DOD				
I	Other [Identify other factors in space below]				

15. What could be done to eliminate or to reduce the concerns listed above [Explain]?

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16. Does your business find it productive to interact with non-Department of Defense federal agencies and laboratories in performing R&D, technology development, and engineering work in connection with developing new products?

\_\_\_ Yes \_\_\_ No [If you **answered "No"** to this question, proceed to Question 17.]

17.	My business finds working with Non-DOD federal agencies not attractive because...	Disagree	Slightly Agree	Agree	Strongly Agree
A	Not much is learned from interacting with federal researchers and technologists				
B	Research facilities at federal labs are not unique or are outdated				
C	Federal researchers are slow to respond to queries and to complete work				
D	Agencies cannot or will not make multi-year commitments				
E	Federal agencies are unreliable partners				
F	Other [List other factors in space below]				

## APPENDIX I

18. Does your business find it productive to interact with Department of Defense organizations in performing R&D, technology development, and engineering work in connection to developing new products?

\_\_\_ Yes \_\_\_ No [If you **answered “No”** to this question, proceed to Question 19.]

19.	My business finds working with DOD agencies and labs not attractive because...	Disagree	Slightly Agree	Agree	Strongly Agree
A	Not much is learned from interacting with DOD researchers and technologists				
B	DOD research facilities and labs are not unique or are outdated				
C	DOD researchers are slow to respond to queries and to complete work				
D	DOD agencies cannot or will not make multi-year commitments				
E	DOD agencies are unreliable partners				
F	Other [List other factors in space below]				

20.	My business' interaction with Non-DOD federal agencies and labs is limited...	Yes	No
A	to circumstances where a federal agency has contracted my firm to assist in the development of a technology or product		
B	by the business' size and resources		
C	by a lack of information on contracting and R&D opportunities		
D	by a corporate policy restricting involvement [Please explain below]		
E	by a lack of grants		
F	by a lack of contracts		
G	Other [List other factors in space below]		

21.	My business' interaction with DOD agencies and labs is limited...	Yes	No
A	to circumstances where a federal agency has contracted my firm to assist in the development of a technology or product		
B	to the scope of business' products and services		
C	by the business' size		
D	by a lack of information on contracting and R&D opportunities		
E	by a corporate policy restricting involvement [Please explain below]		
F	by a lack of grants		
G	by a lack of contracts		
H	because the products have no DOD application		
I	Other [List other factors in space below]		

22.	My business' involvement in DOD R&D and manufacturing programs might be greater were it not for:	Disagree	Slightly Agree	Agree	Strongly Agree
A	DOD R&D collaboration rules				
B	Intellectual property ownership conflicts				
C	Difficulty in identifying opportunities				
D	Lack of timely notification				
E	Perceived DOD favoritism in R&D partnering				
F	Perceived bias against small companies				
G	DOD cost accounting standards				
H	Slowness on progress payments on contracts				
I	Other [Please explain]				

23.	Does your business confer with, seek the assistance of, collaborate with, or contract with Non-DOD federal agencies and labs on...	Yes	No	No, but want to
A	Basic research related to developing commercial products that have no intended defense use			
B	Applied research related to developing commercial products that have no intended defense use			
C	Engineering and development related to creating Commercial products that have no intended defense			
D	Basic research related to developing products or technology intended for defense use			
E	Applied research related to developing products or technology intended for defense use			
F	Engineering and development related to creating products or technology intended for defense use			

## APPENDIX I

24.	Does your business confer with, seek the assistance of, collaborate with, or contract with DOD agencies and labs on...	Yes	No	No, but want to
A	Basic research related to developing defense products that have no intended commercial use			
B	Applied research related to developing defense products that have no intended commercial use			
C	Engineering and development related to creating Defense products that have no intended commercial use			
D	Basic research related to developing products or technology intended for commercial use			
E	Applied research related to developing products or technology intended for commercial use			
F	Engineering and development related to creating products or technology intended for commercial use			

25. In your view, what changes in federal law, policy, operations, and program management are needed to make working with DOD organizations more attractive and productive? [Please Explain]

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26.	For the purposes of conducting R&D, since 1998 has your business and any federal agency entered into a...	Yes	No	With DOD Org	Other Federal Agency
A	Joint venture				
B	Formal Cooperative Research and Development Agreement (CRADA)				
C	Technology license				
D	Formal Work-for-others agreement				
E	Other formal collaboration [Briefly describe below]				
F	Research and development contract				
G	Other [List other factors in space below]				



27.	If you answered “Yes” in Question 26, please report the number of agreements with each listed federal agency for each year in the table displayed here.				
Agency					
Year	1998	1999	2000	2001**	2002**
Central Intelligence Agency					
Department of Commerce					
Department of Defense					
Department of Energy					
Department of Justice					
Dept of Transportation					
Environmental Protection Agency					
Nat’l. Aeronautics & Space Admin					
National Institutes of Health					
National Science Foundation					
National Security Agency					
Other					

[\*\*Projected]

28. Are you currently engaged in any research and development projects that you believe might be of interest to DOD?

\_\_\_ Yes \_\_\_ No \_\_\_ Perhaps, but need more information.  
 \_\_\_ Perhaps, but we don’t intend to pursue DOD uses.

29. Would your company be willing to place information about its research and development projects into a restricted access database for use within DOD?

\_\_\_ Yes \_\_\_ No

## APPENDIX I

30.	What factors would influence your decision not to participate in a DOD research and development database? [Check one box for each category]	Not at All	Slightly	Moderately	Greatly
A	Patent pending				
B	Assists competition				
C	Uncertain website security				
D	Risks loss of proprietary info				
E	Potential loss of commercial advantage				
F	Poorly defined rewards				
G	Patent license restrictions				
H	Uncertain costs				
I	Too much staff time required				
J	Little process transparency				
K	No clear economic benefit				
L	DOD not a major factor in areas of interest				
M	Other [List other factors in space below]				

31. For any ongoing research related to [your technology], when do you anticipate that the results of your research and development will be available in the market-place? \_\_\_\_ Number of years; or \_\_\_\_ Number of months

### V. federal procurement and contracting

- Has your Business ever competed for a federal government contract?  
\_\_\_\_ Yes \_\_\_\_ No
- Is your Business interested in becoming a supplier to the Federal government?  
\_\_\_\_ Yes \_\_\_\_ No
- Is your Business interested in becoming a supplier to the DOD?  
\_\_\_\_ Yes \_\_\_\_ No \_\_\_\_ Already work with DOD

4.	How aware is your Business of the technology capabilities of...	Not At All	Slightly	Moderately	Greatly
A	Department of Defense agencies and labs				
B	Non-DOD Federal agencies and labs				

5.	Which parts of government contracting and procurement procedures discourage you from seeking federal contracting and procurement opportunities?	Not At All	Slightly	Moderately	Greatly
A	Acceptance to the Qualified Product List (QPL)				
B	Meeting the requirements for a first article test				
C	Compliance requirements (validations and certifications)				
D	Frequent re-competition				
E	Uncertainty of government demand				
F	Uncertainty/flux of government funding				
G	Contract duration is too short				
H	Deviation/waiver process				
I	Lack of balanced delivery schedules				
J	Billing complications				
K	Payment delays				
L	Narrow profit margin				
M	Delay between bid and award				
N	Bid and proposal cost				
O	Packaging and marking				
P	Plant facility capability limits				
Q	DOD cost accounting standards				
R	Solicitations are complex				
T	Large firms have established relations for subcontracting				
U	Other [List other factors below]				

## APPENDIX I

6.	Indicate the degree to which DOD Logistics Management practices discourage your Business from doing business with the DOD.	Not At All	Slightly	Moderately	Greatly
A	Defense priority orders disrupt production for commercial delivery				
B	Clearance of paperwork associated with the defense orders is slow				
C	Waivers and deviations processes are slow				
D	Specifications for defense items differ from those for the same commercial product				
E	Design prints for defense orders not readily available; i.e. takes too long to obtain				
F	Arsenal Act requirements				
G	Orders are “bundled” to restrict competition				
H	Warranty requirements				
	Other [List other factors below]				

7.	Identify applicable supply chain issues that discourage your business from accepting or seeking DOD contracts	Not At All	Slightly	Moderately	Greatly
A	Receipt of non-economic quantity orders				
B	Sub-tier supplier constraints				
C	Uncertainty of demand				
D	Item competes for production with commercial products				
E	Product qualification				
F	Contractor logistics support minimizes competition				
G	Too costly for expected benefit				
H	Other [List other factors below]				

8.	How do you most frequently become aware of Non-DOD Federal or DOD procurement or contracting opportunities?	Not At All	Rarely	Moderately	Most Often
A	Commerce Business Daily				
B	Advanced planning briefings to industry				
C	Broad agency announcements				
D	Professional/technical meetings				
E	E-mail distribution				
F	Central Federal Register [or DOD] WEB site				
G	Other Web sites				
H	Trade shows				
I	Professional journals				
J	Professional society announcements/news				
K	Newspaper advertisement				
L	Business associate				
M	[List other means below]				

9.	What would be best way to inform your company of Non-DOD Federal agency – or DOD – contracting and procurement opportunities?	Not At All	Rarely	Moderately	Most Often
A	Commerce Business Daily				
B	Advanced planning briefings to industry				
C	Broad agency announcements				
D	Professional/technical meetings/conferences				
E	E-mail distribution				
F	Central Federal Register [or DOD] Web site				
G	Other Web sites				
H	Trade shows				
I	Professional journals				
J	Professional society announcements/news				
K	Newspaper advertisement				
L	Business associate				
M	Other [List other means below]				

## APPENDIX I

10.	If your Business has stopped providing goods and services to the DOD since the beginning of 1998, identify the degree to which the following factors contributed to that decision:	Not At All	Slightly	Moderately	Greatly
A	Onerous Federal Acquisition Regulations				
B	Cumbersome DOD regulations				
C	Inconsistent procurement practices				
D	Decrease in defense demand				
E	Commercial market more profitable				
F	Sold defense portion of business				
G	Business under new ownership				
H	Acquisition of another business				
I	Delays in payment				
J	DOD discrimination against small business				
K	Reoriented product focus/customer base				
L	Other [List other factors below]				

11. Has your Business acted as a Prime or a Sub-Contractor on a DOD contract within the past five years? \_\_\_ Yes \_\_\_ No

12. If you answered “Yes” to Question 11, did your Business sell this product to the Department of Defense as a commercial or Non-Developmental Item? \_\_\_ Yes \_\_\_ No

13. Does your Business currently have a defense contract? \_\_\_ Yes \_\_\_ No

14. If your Business sells products and services directly to the Department of Defense, are they sold at catalog pricing, i.e., from a published price list? \_\_\_ Yes \_\_\_ No

15. Do you have a separate business unit, subdivision, or office that is devoted exclusively to providing R&D services to the federal government? \_\_\_ Yes \_\_\_ No

16. Do you have a separate business unit, subdivision, or office that is devoted exclusively to manufacturing products for the federal government? \_\_\_ Yes \_\_\_ No

17. Do you use the same employees, facilities and equipment to manufacture commercial and DOD products ? \_\_\_ Yes \_\_\_ No

18. If your Business sells product directly to the DOD, is the production lead-time quoted the same as quoted to your commercial customers?

☐ Yes ☐ No ☐ Not a DOD supplier

19. Is your Business registered in Central Contractor Registration (CCR)?

☐ Yes ☐ No [See <http://www.ccr2000.com/>]

20.	If your Business has not competed for, or fulfilled, any government contracts since 1998, please complete this table.				
	My business would consider becoming a supplier to the government if :	Not At All	Slightly Agree	Moderately Agree	Greatly Agree
A	Changes were made in Federal procurement policy				
B	Government uses shorter bid-delivery purchasing cycles				
C	The government Increases order volumes				
D	The government commits to sustained supply contracts to justify tooling changes				
E	The government adopts E-commerce best practices for rapid product delivery and vendor payment				
F	The government employs fair practices in purchasing to allow companies a fair profit				
G	Other [List other factors below]				

## APPENDIX I

### CERTIFICATION

The undersigned certifies that the information herein supplied in response to this questionnaire is complete and correct to the best of his or her knowledge. The U.S. Code, Title 18 (Crimes and Criminal Procedure), Section 1001, makes it a criminal offense to willfully make a false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

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(Date)

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*(Signature of Authorized Official)*

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(Area Code/Phone Number) (Type or Print Name and Title of Authorized Official)

---

(Area Code/Phone Number) (Name and Title of Person to Contact about this Survey)

---

(Company Name)

### GENERAL COMMENTS

Please use the space below to provide any additional comments or information you may wish regarding this survey, your operations, or other related issues.

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Check this box to obtain a free copy of the report produced from this survey
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## **APPENDIX II – DETAILED RESPONSES BY TECHNOLOGY**

Page 2-7	Advanced Composites
Page 8-13	Batteries
Page 14-19	Power Electronics
Page 20-25	Wireless Broadband
Page 26-31	Special Category

## APPENDIX II

Page Question	Advanced Composites (21) Having Defense Contracts				Advanced Composites (102) Not Having Defense Contracts			
P3-4	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	1	1	0	0	6	0	0	0
B	1	1	0	0	5	1	0	0
C	1	1	0	0	6	0	0	0
D	0	1	0	2	1	2	0	3
p4-5	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	16	1	1	0	82	4	1	1
B	14	3	1	1	82	1	2	2
C	15	2	1	1	82	3	1	1
D	0	0	0	1	7	1	0	1
p4-6	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	14	3	3	0	62	17	4	7
B	12	3	3	2	47	23	19	4
C	7	4	4	5	27	8	24	32
D	10	4	2	4	49	19	16	5
E	8	1	5	6	55	6	11	18
F	11	6	2	1	74	7	5	1
G	0	0	1	0	4	0	1	5
p4-7	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	14	4	1	1	76	7	3	1
B	16	2	1	1	73	8	2	1
C	14	6	0	0	73	6	5	0
D	14	3	2	1	68	9	5	2
E	8	3	4	5	72	9	4	2
F	14	3	3	0	77	6	1	2
G	0	0	0	0	6	0	1	1
p5-8	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	13	1	2	3	76	6	3	2
B	16	1	1	1	74	7	4	0
C	15	3	1	0	73	7	4	0
D	11	4	3	1	69	9	3	4
E	7	1	6	5	70	9	2	5
F	11	2	2	3	76	8	0	1
G	0	0	0	0	5	0	0	1
p5-9	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often

## APPENDIX II

A	5	5	7	3	23	20	35	17
B	2	2	6	9	13	5	24	53
C	8	3	8	1	29	33	22	9
D	7	6	6	1	24	39	27	3
E	6	1	10	2	33	18	30	13
F	11	3	4	1	71	15	5	1
G	10	8	2	0	67	18	5	2
H	0	0	0	0	3	0	0	1
p6-10	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	11	3	3	3	67	12	6	4
B	9	2	5	4	67	8	6	6
C	13	3	3	1	68	7	11	1
D	13	4	2	1	61	14	10	1
E	13	1	4	2	64	8	9	6
F	15	3	2	0	80	3	3	0
G	14	4	2	0	80	4	0	1
H	0	0	0	0	3	1	0	0
p6-11	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	12	4	2	2	76	9	2	2
B	9	3	4	4	78	5	1	5
C	13	4	2	1	74	5	8	1
D	12	5	2	1	71	8	8	0
E	12	4	2	2	71	5	7	5
F	14	5	1	0	81	5	1	0
G	11	5	4	0	83	3	0	1
H	0	0	0	1	4	0	0	0
p7-12	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	4	3	5	0	26	7	6	2
B	3	3	4	2	20	8	8	5
C	3	3	5	1	8	5	16	12
D	3	4	5	1	12	9	10	10
E	6	4	1	1	15	12	7	5
F	4	4	5	0	15	11	11	3
G	4	3	3	2	23	5	8	3
H	10	0	3	0	18	3	17	8
I	0	0	0	1	1	1	0	4
p7-14	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	4	3	4	2	28	6	4	3
B	5	3	3	2	23	9	6	4
C	2	4	5	2	12	5	14	11
D	3	3	6	1	13	12	8	8

## APPENDIX II

E	5	5	1	1	20	7	10	4
F	5	3	4	1	17	10	10	3
G	5	4	2	2	24	5	8	3
H	11	0	2	0	15	8	17	6
I	0	0	0	1	0	0	0	6
p8-16	Yes	No			Yes	No		
	6	12			19	58		
p8-17	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	9	2	2	0	21	5	13	1
B	10	1	0	0	26	9	2	1
C	4	4	4	0	20	7	7	6
D	8	1	1	0	23	7	5	4
E	11	0	1	0	25	5	6	2
F	0	0	0	6	0	0	8	15
p8-18	Yes	No			Yes	No		
	11	8			15	61		
p9-19	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	11	0	0	0	24	7	8	2
B	10	1	0	0	30	7	2	2
C	6	3	1	1	22	7	5	7
D	10	0	0	1	25	8	2	5
E	10	0	0	1	32	2	3	3
F	0	0	0	3	0	1	8	13
p9-20	Yes	No			Yes	No		
A	10	7			19	45		
B	8	9			40	32		
C	15	4			45	26		
D	0	16			4	61		
E	6	10			11	53		
F	10	7			21	46		
G	2	0			13	1		
P9-21	Yes	No			Yes	No		
A	9	8			27	38		
B	8	9			38	31		
C	8	9			38	30		
D	14	5			43	29		
E	0	16			9	56		
F	7	9			14	51		
G	9	8			20	46		
H	3	14			28	37		
I	2	0			11	2		
P10-19	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree

# APPENDIX II

A	9	3	3	1	46	6	6	2
B	6	2	6	3	35	11	11	5
C	3	2	8	6	16	7	25	25
D	6	2	6	3	30	14	13	4
E	9	4	1	3	44	5	6	2
F	15	0	1	2	43	7	5	3
G	11	1	3	3	36	8	10	5
H	14	1	2	0	44	5	6	2
I	0	0	0	0	1	0	4	8
P10-23	Yes	No	No, but want to		Yes	No	No, but want to	
A	1	12	7		12	66	17	
B	3	10	7		17	54	24	
C	2	9	8		15	60	20	
D	0	12	8		4	70	20	
E	2	8	10		5	64	25	
F	1	9	9		6	67	21	
P11-24	Yes	No	No, but want to		Yes	No	No, but want to	
A	1	11	8		2	75	18	
B	3	8	9		5	66	23	
C	2	7	11		5	69	21	
D	0	12	8		1	70	23	
E	3	9	8		5	58	31	
F	4	9	7		5	63	27	
p11-26	Yes	No	With DoD Org.	Other Fed Agency	Yes	No	With DoD Org.	Other Fed Agency
A	0	20	0	0	0	92	2	0
B	0	20	0	0	4	86	3	2
C	0	20	0	0	1	91	2	1
D	0	20	0	0	1	91	2	1
E	0	19	1	0	0	92	2	0
F	1	19	1	0	1	90	2	1
G	1	1	0	0	2	13	0	1
p12-28	Yes	No	Perhaps, need more information	Perhaps, don't intend to pursue	Yes	No	Perhaps, need more information	Perhaps, don't intend to pursue
	7	8	5	0	9	59	25	8
P12-29	Yes	No			Yes	No		
	11	9			37	56		
P13-30	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	4	5	4	5	28	13	18	20

## APPENDIX II

B	3	3	3	9	16	12	16	38
C	4	3	6	5	27	13	23	15
D	2	2	3	11	11	8	25	38
E	3	2	4	9	18	5	20	38
F	3	3	5	7	16	11	25	29
G	5	1	8	4	25	17	19	17
H	2	5	8	3	14	16	27	23
I	1	4	7	6	11	13	23	33
J	6	3	5	2	21	22	16	14
K	4	1	4	9	10	8	27	39
L	8	2	4	4	13	13	24	31
M	0	0	0	0	0	0	0	2
	Yes	No	Already work w/DoD		Yes	No	Already work w/DoD	
p13-1	17	4			16	83		
p13-2	19	0			57	41		
p13-3	16	0	5		57	39	2	
p14-4	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	8	10	2	0	70	27	1	0
B	7	9	4	0	68	27	3	0
p14-5	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	10	3	4	2	34	16	17	3
B	11	3	4	1	39	15	11	4
C	9	4	4	2	28	16	20	7
D	9	0	5	4	30	11	18	11
E	5	5	6	3	22	15	21	18
F	5	5	6	3	27	15	23	9
G	10	3	6	0	41	11	13	5
H	12	2	5	0	39	16	7	4
I	13	1	4	1	38	20	6	4
J	12	6	0	1	37	10	15	8
K	11	3	4	1	35	14	13	8
L	8	4	3	4	23	18	15	15
M	10	5	3	1	33	19	11	6
N	7	4	7	1	29	12	19	10
O	8	7	3	1	39	18	7	5
P	13	3	3	0	40	17	9	5
Q	8	4	3	4	31	15	12	12
R	6	4	6	3	23	13	15	19
T	7	3	2	6	29	10	16	13
U	0	0	0	3	1	0	3	14
p15-6	Not at	Slightly	Mod.	Greatly	Not at	Slightly	Mod.	Greatly

# APPENDIX II

	All				All			
A	11	4	3	0	37	16	9	6
B	8	7	1	2	33	12	15	9
C	7	7	3	1	37	13	12	7
D	7	6	3	2	33	14	12	10
E	4	7	5	2	39	13	8	6
F	10	4	1	0	45	8	5	4
G	8	2	4	2	41	12	4	8
H	8	6	2	1	39	15	4	8
I	0	0	0	1	2	0	3	11
p15-7	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	3	7	6	1	38	11	10	12
B	5	3	6	3	37	16	5	10
C	6	2	6	3	28	18	12	13
D	11	3	3	0	35	17	8	11
E	9	1	3	4	30	18	12	12
F	9	2	5	1	38	14	9	7
G	7	3	4	3	30	12	13	19
H	0	0	0	1	1	0	3	8
p16-8	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	11	1	3	3	65	6	5	0
B	12	6	0	0	62	9	4	0
C	10	4	4	0	60	12	2	0
D	12	4	2	0	54	6	12	3
E	8	4	5	1	60	9	3	1
F	9	3	3	3	68	3	4	0
G	9	5	3	1	59	13	2	0
H	9	6	1	2	48	16	11	0
I	10	5	3	0	53	13	9	1
J	11	5	2	0	55	11	8	0
K	15	3	0	0	62	9	3	0
L	5	7	4	2	49	14	8	3
M	0	0	0	3	0	0	1	5
p16-9	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	10	1	5	2	53	9	8	3
B	6	3	5	4	32	12	28	6
C	5	1	7	4	37	13	16	4
D	5	4	8	1	24	18	26	7
E	0	0	1	17	15	10	22	37
F	2	3	5	9	43	10	13	11
G	4	4	8	2	35	13	18	8
H	4	3	7	4	22	17	31	6

## APPENDIX II

I	5	4	5	4	24	16	28	8
J	5	4	4	5	31	16	20	7
K	12	4	2	0	44	21	6	3
L	5	7	3	3	32	22	15	5
M	0	0	0	1	0	0	0	2
p17-10	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	4	0	0	0	11	2	3	0
B	4	0	0	0	11	2	3	0
C	4	0	0	0	13	1	1	1
D	4	0	0	0	12	2	1	1
E	4	0	0	0	11	2	0	3
F	4	0	0	0	15	1	0	0
G	4	0	0	0	15	1	0	0
H	4	0	0	0	15	1	0	0
I	4	0	0	0	13	3	0	0
J	4	0	0	0	14	1	1	0
K	4	0	0	0	12	3	0	1
L	1	0	0	0	0	0	1	3
	Yes	No			Yes	No		
p17-11	21	0			0	102		
p17-12	16	4			0	3		
p17-13	9	12			0	102		
p17-14	6	12			4	25		
p17-15	0	21			0	100		
p17-16	0	21			0	99		
p17-17	21	0			28	23		
p18-18	Yes	No	Not a DoD Supplier		Yes	No	Not a DoD Supplier	
	10	6	3		11	5	65	
p18-19	12	6			9	81		
p18-20	Not at All	Slightly Agree	Mod. Agree	Strongly Agree	Not at All	Slightly Agree	Mod. Agree	Strongly Agree
A	2	1	2	0	34	18	19	7
B	2	2	0	1	35	21	13	9
C	2	2	0	1	31	25	12	11
D	1	2	1	1	34	19	14	13
E	1	3	1	0	43	13	13	11
F	1	2	2	0	28	12	17	24
G	0	0	0	3	1	1	7	8



Page Question	Batteries (24) Having Defense Contracts				Batteries (27) Not Having Defense Contracts			
P3-4	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	3	0	0	0	1	0	0	0
B	1	1	1	0	1	0	0	0
C	1	0	2	0	1	0	0	0
D	0	0	0	3	1	0	0	1
p4-5	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	10	3	7	2	23	1	0	0
B	9	4	5	5	22	0	2	0
C	9	1	8	5	22	0	0	2
D	1	0	0	3	2	0	0	0
p4-6	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	9	3	6	5	13	6	1	1
B	6	8	7	1	8	7	2	4
C	2	3	10	8	9	1	5	7
D	8	7	5	3	13	1	3	4
E	3	3	7	10	12	5	3	2
F	3	8	9	3	18	2	0	2
G	0	0	0	0	0	1	0	2
p4-7	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	7	4	6	6	16	4	1	1
B	7	11	3	2	16	4	1	0
C	8	7	6	2	15	2	4	0
D	5	3	5	10	17	1	3	0
E	4	3	5	11	14	3	3	1
F	6	6	6	5	19	1	1	0
G	0	0	0	0	1	0	0	0
p5-8	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	3	2	8	10	17	3	1	2
B	7	8	6	2	17	3	1	1
C	7	5	10	1	18	1	1	1
D	3	1	8	11	17	0	3	1
E	3	0	5	15	16	1	3	3
F	7	4	8	4	19	1	1	1
G	0	0	0	1	0	0	0	1
p5-9	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	0	4	7	12	5	1	7	10

## APPENDIX II

B	1	3	8	10	3	3	7	10
C	2	5	11	5	7	9	5	1
D	2	8	10	3	7	6	7	3
E	1	4	12	5	7	4	6	6
F	3	11	5	2	15	5	2	0
G	5	9	5	2	16	3	2	1
H	0	0	0	1	0	0	0	0
p6-10	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	2	6	8	7	11	3	5	4
B	4	6	6	7	10	5	2	5
C	3	8	9	3	14	5	2	1
D	5	8	9	1	11	4	5	3
E	3	7	8	4	12	4	2	5
F	7	11	5	0	17	3	2	0
G	11	9	2	0	17	5	0	0
H	0	0	0	0	0	0	0	0
p6-11	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	1	7	7	8	14	2	2	3
B	2	4	9	8	13	4	2	1
C	5	8	7	3	14	5	1	0
D	4	10	7	2	14	4	1	1
E	3	8	7	4	15	3	1	2
F	6	10	7	0	18	2	0	0
G	12	6	3	1	16	4	0	0
H	0	0	0	0	1	0	0	0
p7-12	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	4	2	2	0	7	2	0	1
B	3	2	3	2	6	1	2	1
C	2	2	3	3	2	3	4	2
D	3	3	1	3	1	3	4	3
E	4	3	3	1	6	1	2	1
F	3	3	0	3	2	5	2	2
G	3	1	3	2	6	2	2	1
H	6	2	0	0	8	0	1	1
I	0	0	0	0	0	0	0	2
p7-14	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	5	2	2	0	8	1	0	1
B	4	1	3	1	6	3	0	1
C	2	3	3	2	2	3	3	3
D	2	4	3	3	1	3	3	4
E	4	1	4	1	6	0	2	2

APPENDIX II

F	2	4	2	2	2	5	1	2
G	3	2	1	3	5	2	3	1
H	8	0	0	0	9	0	1	1
I	0	0	0	0	0	0	0	2
p8-16	Yes	No			Yes	No		
	15	5			5	13		
p8-17	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	0	1	2	0	6	2	3	0
B	0	2	2	0	7	2	2	0
C	0	1	3	0	6	4	1	0
D	0	1	2	1	5	2	3	1
E	2	1	1	0	8	2	1	0
F	0	0	2	0	1	0	1	4
p8-18	Yes	No			Yes	No		
	18	3			4	13		
p9-19	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	4	1	2	0	3	2	5	0
B	3	2	1	0	6	2	2	0
C	2	3	1	0	5	4	1	0
D	1	1	3	1	3	3	3	1
E	1	2	3	0	7	2	1	0
F	0	0	0	0	0	0	0	3
p9-20	Yes	No			Yes	No		
A	13	6			6	11		
B	6	12			8	10		
C	12	7			9	10		
D	1	18			1	16		
E	11	8			5	14		
F	16	5			7	12		
G	1	0			6	0		
P9-21	Yes	No			Yes	No		
A	12	7			5	11		
B	7	11			7	10		
C	3	16			6	10		
D	11	8			8	11		
E	1	17			1	15		
F	9	10			4	13		
G	10	9			6	12		
H	3	16			4	13		
I	2	0			3	0		
P10-19	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	7	10	2	1	9	1	5	0

## APPENDIX II

B	9	5	5	2	8	3	2	2
C	5	5	7	4	1	3	4	9
D	5	6	6	3	3	7	2	3
E	6	8	5	1	9	2	4	0
F	14	4	2	0	11	1	3	0
G	12	5	1	3	7	2	3	3
H	12	5	2	1	8	1	5	0
I	0	0	0	1	0	0	0	3
P10-23	Yes	No	No, but want to		Yes	No	No, but want to	
A	8	11	4		5	13	6	
B	6	13	4		4	14	5	
C	7	11	5		3	14	6	
D	6	11	6		0	15	8	
E	11	8	4		1	15	7	
F	10	8	4		0	15	8	
P11-24	Yes	No	No, but want to		Yes	No	No, but want to	
A	10	8	4		0	19	6	
B	12	5	4		0	18	6	
C	13	5	4		0	17	7	
D	8	7	7		1	16	7	
E	10	6	6		1	16	7	
F	8	8	6		0	16	8	
p11-26	Yes	No	With DoD Org.	Other Fed Agency	Yes	No	With DoD Org.	Other Fed Agency
A	1	20	0	0	1	24	1	0
B	8	13	4	4	0	25	1	0
C	0	21	0	0	2	23	1	1
D	2	19	0	1	1	24	1	0
E	4	17	1	2	0	25	1	0
F	12	9	5	5	0	24	1	0
G	2	1	0	0	1	1	0	0
p12-28	Yes	No	Perhaps, need more information	Perhaps, don't intend to pursue	Yes	No	Perhaps, need more information	Perhaps, don't intend to pursue
	20	2	2	0	5	13	6	3
P12-29	Yes	No			Yes	No		
	17	5			11	13		
P13-30	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	7	6	8	1	9	5	2	5
B	2	6	5	9	3	3	7	9

## APPENDIX II

C	5	7	4	4	5	6	5	6
D	2	3	7	10	3	4	4	12
E	5	1	8	8	3	3	3	14
F	4	6	7	4	3	4	6	9
G	5	10	2	5	5	4	7	5
H	4	9	6	3	4	3	7	8
I	2	7	8	5	3	4	7	9
J	6	8	3	2	4	4	7	4
K	2	6	6	8	2	4	3	15
L	12	4	3	2	3	3	7	8
M	0	0	0	0	0	0	0	1
	Yes	No	Already work w/DoD		Yes	No	Already work w/DoD	
p13-1	22	2			16	11		
p13-2	23	1			20	6		
p13-3	11	1	12		20	6	0	
p14-4	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	1	12	9	3	18	3	4	2
B	3	14	7	1	18	2	5	2
p14-5	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	14	6	2	0	7	2	3	3
B	17	2	3	0	8	3	3	2
C	16	2	3	2	5	6	2	3
D	7	9	4	3	1	8	3	4
E	4	5	12	2	2	5	3	6
F	5	7	8	4	3	7	2	5
G	7	6	7	2	7	5	1	4
H	12	7	1	2	5	5	1	3
I	8	8	5	2	6	3	3	3
J	10	6	5	1	2	5	4	6
K	11	4	5	2	3	4	2	8
L	8	4	9	2	3	2	4	10
M	8	6	5	3	7	2	3	4
N	9	9	1	4	1	5	5	5
O	13	5	4	0	9	2	2	3
P	18	2	2	0	8	1	3	3
Q	14	4	1	4	4	5	2	4
R	11	5	3	3	2	3	7	7
T	14	3	3	2	7	3	0	7
U	0	0	0	1	0	0	0	1
p15-6	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly

## APPENDIX II

A	16	5	1	0	5	4	1	3
B	6	8	7	1	1	5	1	7
C	11	5	5	1	2	5	3	4
D	8	7	6	2	4	3	3	5
E	12	5	4	1	2	4	3	4
F	16	2	1	1	4	2	1	3
G	13	6	1	2	5	2	3	3
H	14	6	2	0	6	2	2	3
I	0	0	0	0	0	0	0	1
p15-7	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	9	6	4	3	3	4	2	5
B	11	3	8	0	1	7	3	3
C	5	5	6	6	2	5	3	4
D	13	5	4	0	4	4	4	2
E	12	8	0	2	6	4	3	1
F	12	7	2	1	5	4	4	1
G	10	9	1	3	2	4	3	7
H	0	0	0	0	0	0	0	0
p16-8	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	7	5	4	6	10	6	2	1
B	5	6	7	5	13	3	2	0
C	5	5	7	6	11	5	1	1
D	5	8	8	2	10	3	4	1
E	6	8	7	2	12	3	2	1
F	10	4	6	3	12	2	1	5
G	11	8	4	0	12	3	0	3
H	11	7	4	1	9	3	5	1
I	11	9	3	0	10	4	4	0
J	12	9	2	0	11	4	2	1
K	11	12	0	0	13	4	1	0
L	7	6	7	2	8	7	3	1
M	0	0	0	4	0	0	1	1
p16-9	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	3	5	5	7	11	6	4	1
B	0	4	10	8	9	4	6	2
C	1	2	12	7	9	7	4	3
D	1	5	11	5	8	4	7	4
E	0	1	7	14	5	1	4	16
F	4	4	10	4	8	2	7	6
G	5	7	9	1	9	4	6	2
H	5	8	8	1	8	2	9	3
I	9	7	6	0	7	4	6	4

## APPENDIX II

J	7	8	6	1	10	4	5	4
K	11	7	4	0	10	7	4	0
L	6	9	6	1	8	6	3	3
M	0	0	0	3	0	0	1	0
p17-10	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	1	0	1	1	2	0	0	1
B	1	1	0	1	2	0	0	1
C	0	0	1	1	2	0	0	1
D	1	0	1	0	2	0	0	0
E	2	0	0	0	3	0	0	1
F	2	0	0	0	3	0	0	0
G	2	0	0	0	3	0	0	0
H	2	0	0	0	3	0	0	0
I	2	0	0	0	2	0	1	0
J	2	0	0	0	3	0	0	0
K	2	0	0	0	2	0	0	0
L	0	0	0	0	0	0	0	0
	Yes	No			Yes	No		
p17-11	24	0			0	27		
p17-12	11	12			0	0		
p17-13	17	7			0	27		
p17-14	4	17			1	8		
p17-15	5	19			0	27		
p17-16	6	18			0	27		
p17-17	21	3			12	6		
p18-18	Yes	No	Not a DoD Supplier		Yes	No	Not a DoD Supplier	
	15	2	4		2	0	20	
p18-19	14	6			6	18		
p18-20	Not at All	Slightly Agree	Mod. Agree	Strongly Agree	Not at All	Slightly Agree	Mod. Agree	Strongly Agree
A	0	0	0	2	4	6	6	3
B	0	0	1	1	5	4	6	3
C	0	0	1	1	3	5	6	3
D	0	0	0	2	4	5	5	3
E	0	0	0	2	3	4	8	3
F	0	0	0	2	3	4	6	5
G	0	0	0	2	0	0	0	4

## APPENDIX II

Page Question	Power Electronics (65) Having Defense Contracts				Power Electronics (58) Not Having Defense Contracts			
P3-4	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	7	2	0	0	3	1	0	0
B	5	3	0	1	3	1	0	0
C	4	1	4	0	3	0	0	0
D	1	2	2	4	0	2	0	2
p4-5	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	35	16	4	7	50	3	0	2
B	26	12	15	9	51	1	2	0
C	24	14	10	13	51	2	1	0
D	4	1	2	6	4	0	1	0
p4-6	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	39	13	6	3	34	8	6	4
B	22	22	10	9	25	14	9	7
C	13	13	15	20	15	6	18	17
D	25	11	15	8	24	15	12	3
E	13	9	17	22	23	10	8	11
F	19	11	15	12	43	4	4	2
G	1	0	0	0	3	0	0	2
p4-7	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	25	10	12	14	41	7	4	4
B	33	13	9	6	45	6	4	1
C	36	12	12	0	44	4	7	0
D	25	7	13	15	43	4	7	2
E	19	10	9	21	38	8	6	4
F	24	11	9	13	45	5	6	0
G	1	0	0	0	2	0	0	0
p5-8	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	21	12	12	18	42	5	5	4
B	32	14	12	4	46	6	3	1
C	34	15	10	0	47	5	3	0
D	23	6	13	19	43	7	5	1
E	14	11	10	26	40	4	5	6
F	22	13	11	16	43	7	3	0
G	2	0	0	0	3	0	0	0
p5-9	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often



## APPENDIX II

A	6	18	26	14	9	13	23	9
B	8	5	24	26	6	8	23	17
C	11	30	17	6	16	16	15	5
D	8	20	27	9	12	15	20	7
E	13	14	23	13	16	9	16	12
F	23	17	16	6	32	14	7	0
G	22	25	12	3	29	19	4	0
H	2	0	0	0	2	0	0	1
p6-10	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	16	10	22	15	33	11	5	6
B	16	11	12	22	36	11	5	3
C	20	21	14	6	37	11	5	1
D	12	21	20	9	34	12	5	4
E	18	14	19	9	36	7	9	1
F	30	16	11	2	43	7	4	0
G	26	24	6	4	44	6	2	2
H	2	0	0	2	3	0	0	0
p6-11	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	12	16	18	17	39	6	7	2
B	15	11	13	23	43	7	2	2
C	18	23	13	6	41	7	6	0
D	13	20	21	8	38	7	7	2
E	19	12	20	9	40	6	7	1
F	28	17	10	3	44	9	1	0
G	31	19	5	4	44	7	2	1
H	2	0	0	3	2	0	0	0
p7-12	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	14	7	4	1	13	6	3	0
B	11	7	4	3	12	4	5	2
C	9	7	7	3	2	2	11	10
D	5	5	8	8	3	5	11	7
E	12	2	7	4	7	7	7	1
F	6	8	5	6	3	12	6	1
G	4	8	6	8	5	4	11	1
H	17	3	5	2	14	2	3	4
I	0	0	0	2	0	0	2	2
p7-14	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	13	7	5	0	12	6	3	1
B	12	7	5	2	13	2	3	3
C	7	5	9	4	2	2	8	10
D	3	3	11	8	4	4	7	8

## APPENDIX II

E	10	3	6	3	5	9	6	1
F	5	8	7	5	3	10	6	1
G	4	9	6	6	6	4	9	1
H	18	1	5	1	10	5	5	4
I	0	0	0	1	0	0	2	2
p8-16	Yes	No			Yes	No		
	34	25			13	35		
p8-17	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	5	6	7	2	10	6	6	3
B	11	4	2	1	16	5	2	2
C	6	1	8	3	7	4	10	3
D	5	5	6	3	11	10	2	2
E	12	2	4	1	11	8	3	4
F	0	0	1	5	0	0	4	8
p8-18	Yes	No			Yes	No		
	44	16			9	39		
p9-19	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	9	5	5	1	10	9	2	3
B	8	6	3	1	11	9	3	1
C	3	3	9	3	7	8	6	4
D	3	7	6	3	10	10	2	3
E	11	5	2	1	11	9	4	1
F	1	0	1	3	0	0	4	11
p9-20	Yes	No			Yes	No		
A	29	23			20	15		
B	20	33			22	16		
C	23	31			21	15		
D	6	47			2	31		
E	19	31			15	18		
F	32	22			20	12		
G	3	3			10	2		
P9-21	Yes	No			Yes	No		
A	29	29			15	17		
B	31	26			22	11		
C	20	38			20	16		
D	21	38			20	14		
E	9	48			0	31		
F	21	34			19	12		
G	30	27			21	9		
H	4	51			15	20		
I	4	2			9	2		
P10-19	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree

## APPENDIX II

A	24	21	8	3	14	6	11	3
B	18	18	13	8	14	11	5	5
C	7	19	21	12	7	4	18	9
D	11	19	19	7	11	8	10	4
E	21	16	11	8	18	6	7	2
F	34	11	4	5	22	3	3	4
G	23	20	4	10	15	3	11	6
H	37	12	4	2	20	7	4	3
I	1	0	3	0	0	0	2	7
P10-23	Yes	No	No, but want to		Yes	No	No, but want to	
A	21	33	8		4	39	11	
B	22	25	16		4	34	17	
C	21	27	15		5	34	16	
D	11	38	13		0	46	9	
E	16	30	17		0	42	13	
F	15	26	19		1	41	12	
P11-24	Yes	No	No, but want to		Yes	No	No, but want to	
A	13	42	6		0	49	7	
B	22	33	7		0	47	8	
C	20	34	8		0	47	8	
D	15	35	11		0	47	9	
E	25	23	14		1	42	13	
F	24	22	15		2	42	12	
p11-26	Yes	No	With DoD Org.	Other Fed Agency	Yes	No	With DoD Org.	Other Fed Agency
A	6	53	4	3	1	55	0	0
B	17	46	8	8	5	51	0	3
C	5	56	4	2	2	54	0	1
D	7	51	5	4	2	54	0	1
E	8	51	4	3	1	53	0	1
F	33	31	19	15	6	51	1	4
G	4	6	3	2	1	9	0	1
p12-28	Yes	No	Perhaps, need more information	Perhaps, don't intend to pursue	Yes	No	Perhaps, need more information	Perhaps, don't intend to pursue
	37	14	9	3	8	31	12	5
P12-29	Yes	No			Yes	No		
	35	23			16	37		
P13-30	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	19	11	11	20	14	12	7	16

## APPENDIX II

B	12	4	13	33	8	11	11	19
C	14	10	20	16	14	10	13	11
D	7	5	16	35	6	10	9	25
E	7	5	22	28	6	7	16	20
F	9	10	19	24	6	5	16	23
G	19	11	12	18	14	9	7	19
H	8	16	23	12	7	8	14	19
I	7	17	24	14	3	4	13	29
J	15	14	19	7	11	10	13	12
K	8	4	16	34	5	1	16	29
L	29	12	10	10	7	3	12	27
M	1	0	0	1	0	0	1	1
	Yes	No	Already work w/DoD		Yes	No	Already work w/DoD	
p13-1	59	5			15	43		
p13-2	56	6			27	31		
p13-3	28	8	28		23	31	3	
p14-4	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	10	18	27	10	29	17	8	2
B	9	28	25	3	29	14	12	1
p14-5	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	42	10	8	3	16	7	10	9
B	47	8	4	3	18	7	10	6
C	37	12	8	5	13	5	12	12
D	19	19	14	9	12	4	15	11
E	12	21	17	13	9	4	18	10
F	12	16	18	17	8	4	18	10
G	28	14	19	2	14	8	12	6
H	38	13	10	1	13	10	14	3
I	29	22	7	5	14	12	9	5
J	34	10	15	4	12	13	7	9
K	33	16	10	4	14	7	10	11
L	13	20	19	10	9	3	17	14
M	16	13	26	8	9	7	12	13
N	16	21	20	6	6	7	13	15
O	43	13	6	1	14	9	13	4
P	42	18	3	0	17	5	11	8
Q	32	11	11	9	10	7	9	15
R	15	23	15	10	6	8	10	18
T	26	14	12	10	11	4	13	13
U	1	0	1	1	0	0	1	8
p15-6	Not at	Slightly	Mod.	Greatly	Not at	Slightly	Mod.	Greatly

## APPENDIX II

	All				All			
A	46	7	6	4	17	4	4	10
B	30	18	9	6	13	7	1	13
C	26	24	9	4	14	6	5	8
D	23	15	16	9	12	5	4	14
E	32	23	6	1	13	9	4	7
F	46	5	2	1	19	3	6	3
G	39	11	7	3	16	8	4	6
H	38	16	6	1	17	7	4	6
I	0	1	0	0	1	0	2	3
p15-7	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	28	14	14	7	10	9	8	11
B	32	21	6	3	12	12	6	7
C	18	19	19	7	12	6	8	11
D	32	19	9	3	17	6	6	9
E	34	13	11	4	9	10	10	9
F	34	14	10	2	12	9	10	6
G	22	21	11	8	10	2	10	19
H	1	0	0	0	2	0	1	1
p16-8	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	14	10	20	17	34	6	1	2
B	21	14	20	7	36	2	3	2
C	11	10	21	21	34	5	3	3
D	16	13	25	7	27	6	9	1
E	18	19	17	5	34	4	6	0
F	21	19	16	2	36	4	2	1
G	21	17	17	5	35	7	2	0
H	18	27	14	1	28	10	3	2
I	23	29	8	0	29	9	3	2
J	28	20	11	0	32	8	1	2
K	41	16	3	0	34	9	0	0
L	12	16	22	10	25	10	5	4
M	1	0	0	7	3	0	0	4
p16-9	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	10	9	23	18	29	7	3	0
B	12	7	19	20	23	4	10	2
C	9	9	17	25	24	6	9	2
D	11	10	24	12	16	8	12	3
E	3	4	18	36	12	3	13	16
F	6	14	23	16	20	5	8	7
G	14	18	16	9	22	5	7	5
H	16	19	17	4	16	4	21	0

## APPENDIX II

I	15	20	20	3	15	7	17	3
J	15	19	19	5	17	12	9	2
K	33	19	3	2	24	13	4	1
L	20	16	14	7	19	10	6	5
M	1	0	0	5	2	0	1	4
p17-10	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	9	1	0	2	3	0	1	3
B	9	1	0	2	3	0	1	3
C	8	2	2	0	4	2	1	0
D	9	0	2	1	4	1	2	0
E	8	2	1	1	2	0	1	4
F	10	1	0	0	6	0	0	1
G	11	1	0	0	5	1	1	0
H	12	0	0	0	7	0	0	0
I	11	1	0	0	6	1	0	0
J	10	2	0	0	6	1	0	0
K	9	1	1	1	5	0	0	2
L	1	0	0	0	1	0	1	1
	Yes	No			Yes	No		
p17-11	65	0			0	58		
p17-12	28	35			0	0		
p17-13	44	21			1	55		
p17-14	18	38			8	12		
p17-15	4	61			0	56		
p17-16	7	57			0	56		
p17-17	60	4			19	12		
p18-18	Yes	No	Not a DoD Supplier		Yes	No	Not a DoD Supplier	
	40	12	9		7	3	33	
p18-19	44	9			10	44		
p18-20	Not at All	Slightly Agree	Mod. Agree	Strongly Agree	Not at All	Slightly Agree	Mod. Agree	Strongly Agree
A	4	0	1	0	16	10	5	7
B	4	0	1	0	18	7	11	3
C	3	2	0	0	12	10	10	6
D	3	1	1	0	14	7	15	3
E	4	1	0	0	15	12	7	4
F	3	1	0	1	15	4	12	9
G	0	0	0	1	1	0	0	4

Page Question	Wireless Broadband (48) Having Defense Contracts				Wireless Broadband (82) Not Having Defense Contracts			
P3-4	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	1	1	0	0	6	0	0	0
B	1	2	0	0	6	0	0	0
C	1	0	2	0	4	1	0	1
D	0	0	0	3	0	0	1	6
p4-5	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	28	10	1	1	70	5	1	0
B	21	9	7	4	69	4	3	0
C	18	6	8	9	66	7	2	2
D	1	0	0	3	5	0	1	2
p4-6	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	19	13	7	5	25	15	17	21
B	8	16	17	1	19	16	24	20
C	6	11	13	13	14	14	14	37
D	19	12	10	3	33	17	19	7
E	8	8	6	19	26	12	19	22
F	19	14	4	3	58	11	6	2
G	0	0	0	2	2	0	0	1
p4-7	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	25	8	5	5	61	5	4	7
B	29	6	7	1	65	6	2	4
C	30	6	6	1	64	7	5	1
D	24	6	10	3	58	2	11	5
E	21	5	7	10	50	10	8	8
F	27	8	2	5	64	6	3	2
G	1	0	0	1	3	1	0	2
p5-8	Not at All	Slightly	Mod.	Most Often	Not at All	Slightly	Mod.	Most Often
A	22	10	6	5	60	3	5	9
B	28	5	9	1	63	4	4	4
C	28	7	7	1	64	3	7	1
D	19	7	11	6	57	4	10	5
E	13	8	7	15	50	5	9	12
F	21	13	3	6	68	2	4	1
G	0	0	0	1	3	0	0	0
p5-9	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often

## APPENDIX II

A	5	5	20	16	10	11	32	27
B	4	7	13	21	5	7	32	36
C	8	10	18	10	13	15	30	22
D	6	13	18	9	16	29	26	9
E	6	10	18	12	12	10	43	15
F	16	20	5	4	54	13	8	4
G	20	14	6	3	40	19	14	3
H	0	1	1	0	1	0	1	1
p6-10	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	15	10	12	8	54	11	6	6
B	15	10	10	9	50	11	7	9
C	17	12	10	6	54	10	8	6
D	18	6	13	8	56	15	5	2
E	17	8	13	7	51	9	12	5
F	23	15	3	1	65	7	2	1
G	32	7	3	2	66	7	1	1
H	1	1	0	0	3	2	0	4
p6-11	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	13	7	13	10	59	8	6	6
B	13	10	6	13	57	9	5	7
C	19	8	10	7	60	7	7	4
D	18	6	14	6	63	8	5	2
E	17	7	12	8	58	5	11	4
F	24	13	4	1	70	7	1	0
G	29	8	3	2	71	5	1	1
H	1	0	0	0	1	0	0	1
p7-12	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	14	2	2	0	22	11	2	1
B	11	6	1	0	22	9	4	3
C	6	6	4	2	11	7	12	10
D	6	6	4	3	9	6	15	8
E	8	7	3	0	18	8	5	6
F	6	7	5	0	14	8	10	4
G	5	6	6	2	18	9	6	5
H	11	3	3	1	21	7	3	4
I	0	0	0	1	0	0	3	1
p7-14	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	13	3	1	0	23	11	3	1
B	11	5	1	0	25	10	1	3
C	4	10	1	2	12	9	11	9
D	4	8	4	2	13	5	13	9



## APPENDIX II

E	9	5	3	0	22	8	4	5
F	7	5	5	1	15	12	8	3
G	6	5	5	2	20	8	6	5
H	13	2	1	1	23	8	6	3
I	0	0	0	2	0	0	3	1
p8-16	Yes	No			Yes	No		
	20	24			25	49		
p8-17	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	8	5	4	0	13	10	17	2
B	11	4	1	0	21	10	7	2
C	5	7	5	0	17	9	13	1
D	7	2	6	3	19	8	9	3
E	9	7	1	0	21	8	6	3
F	1	1	2	4	0	0	4	11
p8-18	Yes	No			Yes	No		
	27	15			22	48		
p9-19	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree
A	11	4	2	0	17	13	12	3
B	11	5	0	0	27	6	7	3
C	4	8	4	1	20	10	12	1
D	7	3	4	1	21	9	8	4
E	13	2	1	0	22	10	6	3
F	0	0	2	4	0	0	4	9
p9-20	Yes	No			Yes	No		
A	23	15			26	37		
B	23	16			40	30		
C	30	11			46	23		
D	7	31			2	65		
E	17	21			21	42		
F	29	10			35	31		
G	7	0			9	0		
P9-21	Yes	No			Yes	No		
A	26	16			24	37		
B	27	16			42	22		
C	20	19			36	32		
D	28	15			37	31		
E	7	34			4	61		
F	19	23			23	41		
G	25	14			32	33		
H	4	33			11	47		
I	2	1			6	0		
P10-19	Disagree	Slightly Agree	Agree	Strongly Agree	Disagree	Slightly Agree	Agree	Strongly Agree

## APPENDIX II

A	14	11	10	3	34	16	10	2
B	12	14	7	6	35	8	13	8
C	6	8	17	14	14	4	29	23
D	9	13	12	6	28	15	14	5
E	24	6	7	3	41	10	5	4
F	21	10	3	4	40	12	9	0
G	9	10	8	10	37	6	9	10
H	20	13	3	2	37	12	7	4
I	0	0	0	2	0	1	2	4
P10-23	Yes	No	No, but want to		Yes	No	No, but want to	
A	3	32	10		9	58	12	
B	4	23	19		7	53	18	
C	4	22	21		7	55	17	
D	6	29	11		2	64	13	
E	8	21	18		2	59	18	
F	8	22	17		4	57	18	
P11-24	Yes	No	No, but want to		Yes	No	No, but want to	
A	5	32	9		3	67	9	
B	9	25	12		4	61	14	
C	10	24	14		4	59	16	
D	4	28	14		3	60	15	
E	7	22	17		5	53	20	
F	7	21	19		5	53	21	
p11-26	Yes	No	With DoD Org.	Other Fed Agency	Yes	No	With DoD Org.	Other Fed Agency
A	2	44	1	1	0	75	3	0
B	6	40	4	5	0	74	3	0
C	4	42	2	2	2	72	3	1
D	1	46	1	0	0	74	3	0
E	1	45	1	0	0	74	3	0
F	11	34	9	5	2	74	3	0
G	1	5	2	0	2	11	1	0
p12-28	Yes	No	Perhaps, need more information	Perhaps, don't intend to pursue	Yes	No	Perhaps, need more information	Perhaps, don't intend to pursue
	20	7	17	3	15	29	27	8
P12-29	Yes	No			Yes	No		
	33	9			36	38		
P13-30	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	18	8	9	10	19	15	16	21

## APPENDIX II

B	10	10	9	16	17	10	22	22
C	11	14	14	6	26	11	18	15
D	9	9	14	14	12	13	17	30
E	11	6	11	17	16	6	21	29
F	5	9	17	12	14	8	23	27
G	18	12	8	6	30	9	18	12
H	8	14	14	9	13	14	28	16
I	7	9	18	12	9	16	24	24
J	11	10	16	5	23	13	23	11
K	7	10	17	11	12	7	22	31
L	21	9	11	2	19	6	17	26
M	0	0	0	0	0	0	1	2
	Yes	No	Already work w/DoD		Yes	No	Already work w/DoD	
p13-1	43	2			22	58		
p13-2	43	2			57	20		
p13-3	21	1	23		53	22	3	
p14-4	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	14	23	6	5	44	19	15	2
B	16	22	6	4	37	27	15	1
p14-5	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	18	11	13	2	26	18	15	7
B	20	17	7	2	29	17	11	8
C	16	6	14	8	22	15	22	8
D	9	12	19	7	19	15	24	8
E	6	11	20	10	16	9	24	17
F	6	12	17	12	16	14	21	16
G	17	19	10	0	27	23	12	5
H	16	15	14	0	31	18	13	4
I	16	20	10	0	30	21	13	2
J	14	8	17	7	28	14	14	10
K	15	18	6	7	26	13	17	9
L	9	10	17	10	20	10	21	14
M	8	14	20	5	20	11	20	14
N	7	15	19	6	19	11	22	15
O	21	10	14	0	34	19	11	2
P	29	11	5	0	41	11	12	3
Q	12	12	11	9	27	15	10	14
R	7	16	17	6	15	14	24	15
T	10	13	13	10	21	11	17	16
U	2	0	2	3	0	0	0	5
p15-6	Not at	Slightly	Mod.	Greatly	Not at	Slightly	Mod.	Greatly

## APPENDIX II

	All				All			
A	22	20	6	1	33	18	6	6
B	15	21	6	6	25	13	16	8
C	18	15	10	5	25	14	17	5
D	17	11	12	8	22	13	9	20
E	23	14	7	4	29	19	9	4
F	35	8	1	1	43	11	4	1
G	26	11	9	1	34	13	9	4
H	30	12	5	0	35	18	4	2
I	1	0	0	0	0	0	0	2
p15-7	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	18	13	12	5	31	15	9	6
B	18	12	14	4	30	17	8	5
C	11	15	15	7	19	14	17	12
D	20	19	6	3	33	11	8	9
E	17	13	12	5	24	14	15	9
F	19	15	12	1	27	19	9	7
G	17	14	11	6	20	12	15	15
H	0	1	0	1	0	0	0	4
p16-8	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	19	14	8	5	51	12	3	2
B	28	9	4	5	49	11	6	0
C	18	13	11	4	40	21	5	3
D	16	11	14	5	34	22	10	2
E	25	13	7	1	45	14	7	2
F	21	15	7	3	53	8	4	1
G	21	13	10	2	44	16	5	2
H	18	16	11	1	38	19	10	1
I	23	14	7	2	39	20	8	1
J	24	17	5	0	43	13	9	2
K	34	11	1	0	52	9	5	0
L	11	12	17	6	35	20	9	4
M	1	0	3	1	1	1	1	4
p16-9	Not at All	Rarely	Mod.	Most Often	Not at All	Rarely	Mod.	Most Often
A	11	17	9	4	41	20	5	1
B	9	7	19	7	26	20	18	6
C	8	10	14	10	27	19	17	4
D	4	9	23	8	16	17	27	10
E	2	4	16	24	13	8	16	35
F	8	14	12	9	31	19	13	8
G	9	16	12	6	28	21	11	7
H	9	13	15	4	15	21	30	3

## APPENDIX II

I	11	14	14	2	18	18	28	5
J	10	19	11	1	20	26	19	2
K	18	16	6	1	37	20	10	0
L	8	12	13	7	21	17	19	9
M	1	0	0	2	0	0	0	4
p17-10	Not at All	Slightly	Mod.	Greatly	Not at All	Slightly	Mod.	Greatly
A	5	2	2	2	8	1	1	0
B	6	0	4	1	8	1	1	0
C	7	3	1	0	8	2	0	0
D	3	3	3	2	7	0	1	2
E	4	0	1	6	5	0	2	3
F	9	0	0	2	10	0	0	0
G	10	0	0	1	9	0	1	0
H	11	0	0	0	10	0	0	0
I	10	0	1	0	9	1	0	0
J	10	0	0	1	9	0	0	1
K	4	2	3	2	5	1	1	2
L	0	0	0	0	0	0	0	0
	Yes	No			Yes	No		
p17-11	48	0			0	82		
p17-12	35	9			0	4		
p17-13	24	23			3	78		
p17-14	28	12			16	17		
p17-15	3	45			2	78		
p17-16	1	47			0	80		
p17-17	45	3			33	12		
p18-18	Yes	No	Not a DoD Supplier		Yes	No	Not a DoD Supplier	
	36	3	7		16	3	50	
p18-19	30	14			21	53		
p18-20	Not at All	Slightly Agree	Mod. Agree	Strongly Agree	Not at All	Slightly Agree	Mod. Agree	Strongly Agree
A	4	1	3	1	25	12	14	6
B	5	1	2	1	23	9	16	10
C	2	3	2	1	20	9	18	10
D	5	2	1	0	26	12	13	8
E	4	2	1	2	25	14	10	10
F	1	1	4	2	20	6	20	13
G	0	0	0	0	1	0	1	9

## APPENDIX II

Page Question	Special Category (44)			
P3-4	Not at All	Rarely	Mod.	Most Often
A	1	2	0	0
B	0	2	1	0
C	0	0	2	1
D	0	0	0	4
p4-5	Not at All	Rarely	Mod.	Most Often
A	15	9	11	1
B	10	3	15	9
C	9	3	10	13
D	0	0	1	2
p4-6	Not at All	Slightly	Mod.	Most Often
A	10	8	10	3
B	6	2	8	21
C	10	9	11	5
D	7	8	13	9
E	7	9	16	4
F	16	10	7	2
G	0	0	0	1
p4-7	Not at All	Slightly	Mod.	Most Often
A	12	9	10	4
B	7	6	9	16
C	9	4	14	11
D	14	12	11	1
E	11	15	10	2
F	12	8	7	11
G	0	0	0	0
p5-8	Not at All	Slightly	Mod.	Most Often
A	10	6	12	7
B	6	1	13	19
C	6	1	16	14
D	14	11	12	1
E	9	17	11	1
F	7	6	10	15
G	0	0	0	1
p5-9	Not at All	Rarely	Mod.	Most Often

A	13	15	9	1
B	10	16	6	5
C	11	11	16	0
D	5	15	18	0
E	9	15	13	1
F	4	2	15	17
G	3	4	20	11
H	1	0	0	1
p6-10	Not at All	Rarely	Mod.	Most Often
A	18	12	8	0
B	10	18	8	1
C	16	8	14	0
D	11	16	11	0
E	14	12	12	0
F	6	4	12	16
G	7	6	17	8
H	0	1	0	1
p6-11	Not at All	Rarely	Mod.	Most Often
A	16	12	6	3
B	10	18	7	3
C	16	10	12	0
D	9	17	12	0
E	14	13	9	2
F	4	2	8	24
G	6	4	15	13
H	0	0	1	2
p7-12	Disagree	Slightly Agree	Agree	Strongly Agree
A	10	3	3	0
B	0	3	8	4
C	0	4	8	3
D	2	7	6	0
E	1	4	7	3
F	2	11	2	0
G	8	6	1	0
H	9	4	2	0
I	0	0	1	3
p7-14	Disagree	Slightly Agree	Agree	Strongly Agree
A	12	1	0	0
B	0	7	5	2
C	1	8	4	0
D	1	8	4	0

## APPENDIX II

E	3	5	4	2
F	3	8	2	0
G	7	6	0	0
H	6	5	3	0
I	0	0	1	2
p8-16	Yes	No		
	27	9		
p8-17	Disagree	Slightly Agree	Agree	Strongly Agree
A	4	3	1	1
B	3	2	5	1
C	3	3	4	0
D	7	3	0	0
E	7	3	0	0
F	0	0	0	4
p8-18	Yes	No		
	31	4		
p9-19	Disagree	Slightly Agree	Agree	Strongly Agree
A	7	2	2	0
B	3	3	4	3
C	5	5	1	0
D	9	2	0	0
E	9	2	0	0
F	0	0	0	4
p9-20	Yes	No		
A	21	12		
B	11	22		
C	2	32		
D	17	18		
E	15	19		
F	15	18		
G	6	1		
P9-21	Yes	No		
A	1	31		
B	22	13		
C	12	22		
D	0	33		
E	12	24		
F	15	20		
G	20	15		
H	11	23		
I	3	0		
P10-19	Disagree	Slightly Agree	Agree	Strongly Agree



A	30	4	0	0
B	26	4	3	2
C	25	4	4	0
D	14	11	8	1
E	15	8	8	2
F	9	10	14	3
G	7	15	7	6
H	15	9	5	1
I	0	1	1	4
P10-23	Yes	No	No, but want to	
A	21	8	13	
B	20	11	11	
C	14	18	10	
D				
E	13	16	13	
F	12	21	9	
P11-24	Yes	No	No, but want to	
A	17	11	13	
B	14	16	11	
C	12	19	10	
D				
E	27	6	8	
F	18	14	9	
p11-26	Yes	No	With DoD Org.	Other Fed Agency
A	1	38	0	1
B	17	23	9	8
C	8	30	3	4
D	3	34	1	2
E	8	29	1	5
F	22	17	13	7
G	4	2	1	2
p12-28	Yes	No	Perhaps, need more information	Perhaps, don't intend to pursue
	25	11	7	0
P12-29	Yes	No		
	30	9		
P13-30	Not at All	Slightly	Mod.	Greatly
A	24	4	5	3

## APPENDIX II

B	3	6	16	13
C	9	11	12	2
D	2	14	12	10
E	2	14	15	7
F	3	15	10	10
G	3	9	14	12
H	3	8	7	20
I	1	3	10	24
J	2	9	14	13
K	2	5	9	22
L	6	18	6	8
M	0	0	0	0
	Yes	No	Already work w/DoD	
p13-1	38	4		
p13-2	38	2		
p13-3	12	6	25	
p14-4	Not at All	Slightly	Mod.	Greatly
A	4	9	17	11
B	6	15	18	2
p14-5	Not at All	Slightly	Mod.	Greatly
A	25	9	6	0
B	23	8	6	3
C	27	4	4	5
D	32	7	1	0
E	33	6	1	0
F	18	8	11	3
G	18	13	5	4
H	16	9	7	8
I	27	8	3	2
J	27	5	8	0
K	22	10	6	2
L	25	9	5	1
M	17	13	6	4
N	12	10	13	5
O	15	8	13	4
P	15	12	8	5
Q	30	7	0	3
R	34	5	0	1
T	27	8	2	3
U	0	0	0	5
p15-6	Not at	Slightly	Mod.	Greatly

	All			
A	27	8	3	0
B	26	4	8	1
C	31	3	1	1
D	23	8	7	1
E	21	12	4	3
F	21	9	8	1
G	20	12	4	3
H	29	8	2	1
I	1	0	0	2
p15-7	Not at All	Slightly	Mod.	Greatly
A	21	10	6	3
B	30	9	1	0
C	23	12	4	1
D	30	6	2	2
E	17	14	7	2
F	25	10	3	2
G	20	12	4	4
H	0	0	0	1
p16-8	Not at All	Rarely	Mod.	Most Often
A	8	8	13	6
B	23	9	3	0
C	14	16	5	0
D	14	15	6	0
E	6	15	14	0
F	11	11	10	1
G	11	9	14	0
H	12	13	8	1
I	6	10	13	6
J	6	8	14	7
K	8	7	13	7
L	11	11	10	7
M	0	0	1	7
p16-9	Not at All	Rarely	Mod.	Most Often
A	8	14	9	5
B	17	13	4	1
C	14	10	8	2
D	12	11	9	2
E	6	13	15	2
F	6	9	15	5
G	6	5	14	10
H	2	4	10	22

## APPENDIX II

I	2	4	18	12
J	2	3	16	16
K	0	1	12	25
L	4	8	11	14
M	0	0	2	4
p17-10	Not at All	Slightly	Mod.	Greatly
A	4	0	0	0
B	4	0	0	0
C	4	0	0	0
D	4	0	0	0
E	4	0	0	0
F	5	0	0	0
G	5	0	1	0
H	5	1	0	0
I	5	0	0	1
J	5	0	0	1
K	5	0	0	1
L	0	0	0	2
	Yes	No		
p17-11	40	4		
p17-12	19	18		
p17-13	36	8		
p17-14	9	27		
p17-15	9	33		
p17-16	10	33		
p17-17	35	7		
p18-18	Yes	No	Not a DoD Supplier	
	30	3	7	
p18-19	33	6		
p18-20	Not at All	Slightly Agree	Mod. Agree	Strongly Agree
A	0	0	2	1
B	0	2	1	0
C	1	1	1	0
D	0	1	2	0
E	1	1	1	0
F	0	1	1	2
G	0	0	0	3

## APPENDIX III – SHARED TECHNOLOGIES BY TECHNOLOGY SECTOR

Advanced Composite Companies That to Share Technology				
# of Companies Reporting	75		16	
Contracting Status	Non-Defense Contractors		Defense Contractors	
Technology	Government	Private	Government	Private
Acoustic Design	1	1		
Advanced Materials	8	21	6	9
Antifouling Paints	1	1		
Applications	1	11	2	1
Barrier Coatings	3	19	2	4
Bio-Inspired Materials	1	3		
Bomb blast protection			1	1
Components	4	4	2	5
Electronic Materials	3	15	1	2
Environmental Design	1	2	1	1
Fabrication Processes	5	18	2	7
Fatigue-failure Analysis	1	12	1	1
Fiber/Cloth	1	12	1	3
Floor design		1		
High-Temp Materials	6	23	1	7
Mfg. Process Control	2	12		2
Mold Forming	1	12	1	1
Multifunction Materials	3	15	1	3
Natural disaster protection			1	1
Noise Control MTLs				1
Reliability	1	2		
Reliability/Aging	2	14	1	1
Resins	8	47	1	1
Security			1	1
Solar Control				1
Simulation Software		1		
Structural Design	2	9	1	1
Thermal Design	3	11	1	3

# APPENDIX III

Battery Companies That to Share Technology				
# of Companies Reporting	16		21	
Contracting Status	Non-Defense Contractors		Defense Contractors	
Technology	Government	Private	Government	Private
Advanced Materials	3	5	8	6
Alloys				1
Applications	2	7	8	11
Battery Lifetime	4	14	18	17
Components		5	7	8
Electrochemistry	3	7	13	12
Environmental Design	1	3	4	7
Fabrication Methods	1	4	5	4
Manufacturability	3	5	11	1
Maximum Charge Cycles	3	1	16	16
Metallurgy	1	4	5	6
Mfg. Process Control	1	5	8	9
Performance	3	11	18	16
Power Storage Density	3	9	12	14
Recycling				1
Reliability	2	5	11	11
Reliability/Aging		2		
Simulation	4	6	6	3
Software		1	3	2
Specification Review				1
Structural Design	2	5	9	9
Supporting Electronics		3	8	8
Thermal Design	2	4	7	5

Power Electronics Companies that Share Technology				
# of Companies Reporting	39		59	
Contracting Status	Non-Defense Contractors		Defense Contractors	
Technology	Government	Private	Government	Private
Advanced Materials	1	4	2	18
Applications	3	11	19	17
Batteries		1		
Catalysts		1		
Ceramics	1	2	6	6
Circuit Designs	3	21	3	3
Components	2	1	27	19
Design/Manufacture		1		
Device, Network Software		1		
Electronic Systems		1		
Electronics	4	25	39	35
Environmental Design	1	2	16	13
Fabrication Methods	1	5	2	2
Fatigue-failure Analysis	1	6	2	17
Fuel Cells			1	
Fuel Cell Power Plants	1	1		
High Power	3	8	2	19
Manufacturability	2	9	2	21
Mfg. Process Control	1	5	12	13
Network Control		1		
Performance	3	11	23	2
Reliability	2	1	24	21
Simulation	1	9	21	2
Software	2	8	24	2
Structural Design	1	1	18	14
Switch Architecture		1	11	1
System Reliability		1		
Thermal Design	2	11	25	23
Topological Design	1	2	13	1
Welding processes		1		

# APPENDIX III

Wireless Broadband Companies that to Share Technology				
# of Companies Reporting	57		34	
Contracting Status	Non-Defense Contractors		Defense Contractors	
Technology	Government	Private	Government	Private
Advanced Materials		1	1	1
Aerospace Systems			1	1
Aircraft/Space platforms			1	1
Antennae Systems		8	6	6
Applications	4	13	9	13
Avionics			1	1
Barrier Coatings		1		
Battle Management Systems			1	1
Circuit Designs	1	9	6	11
Communications			1	1
Components	3	18	12	14
Data Traffic Mgt		19	7	1
Device Failure Analysis	3	9	5	5
Device, Network Software	3	24	7	8
Electroic Systems	6	18	8	11
Electronic Materials		1		
Electronics		1	1	1
Environmental Design		3	5	3
Frequency Filters	1	1	7	1
High Bandwidth Data Systems			1	1
High Performance Computing			1	
High Power		1		
Land/Armored Vehicles			1	1
Mfg. Process Control		2	5	8
Missile Technology			1	
Mobile Devices		14	3	9
Mobile Systems	1	9	5	9
Multifunction Materials		1		
Network Control	3	18	6	9
Performance		1		
Reliability		1		
Resins		1		
Ruggedness	1	4	3	4
Simulation		3	5	4
Software		1	1	1
Stationary Systems	3	15	5	12
Switch Architecture	1	15	6	9
System Reliability	1	7	5	8
Thermal Design		5	5	5
Topological Design		1		
Unmanned Aircraft			1	1



Special Category Companies That to Share Technology				
# of Companies Reporting	33			
Contracting Status: Both	Sharing Partner			
Technology	Government	Private		
Advanced Materials	17	15		
Aerospace Systems	15	16		
Aircraft/Space platforms	16	16		
Avionics	9	7		
Battle Management Systems	4	3		
Communications	8	7		
Electronics	1	1		
Electro-optics	1	1		
Heavy Weapons	3	3		
High Bandwidth Data Systems	6	5		
High Performance Computing	2	3		
Land Vehicles/Armored Vehicles	8	9		
Missile Technology	1	5		
Munitions	1			
Nuclear Technology	2	2		
Propulsion Power Generation	1	11		
Reconnaissance	9	4		
Simulation	9	5		
Simulation Software		1		
Software	8	9		
Space Launch	6	4		
Unmanned Aircraft	9	1		



## APPENDIX IV – COMPANY REPORTED PRODUCT DESCRIPTIONS

Advanced Composites Reported by Defense Contractors	
NAICS	Products
3255, 3259	Highly functional coatings to provide lubrication, corrosion resistance, electrical control, thermal control. E/M also has a network of coating application centers which apply functional coatings to customer parts.
3255	Electronic materials; Manufacturing of polyimide liquid coatings
3261	Manufacturing and marketing noise control materials and custom engineered noise control products to OEM equipment manufacturers for incorporation into the products they make and sell.
326299	Custom molded polyurethane and silicone products
3261	Cast polyurethane products - We are a custom molder of urethane products and also offer some products marketed under our name.
3261	Fabricate plastic water tanks for fire apparatus
326113	Plastic film and laminates, producer of plastic film and laminates.
326113	Vacuum bagging consumable materials- eg nylon films, tapes, fabrics used to form composite parts
3261	Film and sheet rolled goods produced from primarily thermoplastic urethane
3323, 3329, 3364	Aircraft radomes, aircraft composites structures, military shelters and enclosures.
336412	Original equipment manufacture and overhaul and repair of aerospace composite and bonded structures.
3261	Plastic compounds, colors and film for plastics industry
Batteries Reported by Defense Contractors	
NAICS	Products
3359	Lead-acid batteries. We manufacture and distribute lead-acid batteries for automotive, motive power, and stationary applications.
33591	Specialty Batteries, Standard Size Government Cells/Batteries.
335911	Lead acid batteries
335911	Manufactures and distributes a full line of calcium maintenance free and low antimony, low maintenance automotive, commercial, farm tractor, marine and specialty batteries; industrial batteries for motive power, mining, and railroads.
335911	1. Lithium ion rechargeable batteries 2. Research and manufacture of lithium ion rechargeable batteries and sale of such batteries
335911	Auto components Building controls and services
335916	Batteries and flashlights (round cell, specialty); battery chargers; R&D on alternative battery chemistries
335911, 335912	Batteries manufactured in Germany, sales office only at US location

# APPENDIX IV

3359, 1133, 5912	Manufacturer of lead acid and sealed recombinant batteries
335912	Lithium batteries, capacitors, micro-machined components, medical feed throughs & electrodes, RF filters
335912	Batteries. Manufacture lithium primary and lithium-ion rechargeable batteries.
335912	Batteries for battlefield power
335912	Batteries - design, develop, manufacture and marketing of batteries and related products mainly in the lithium technologies
Power Electronics Reported by Defense Contractors	
NAICS	Products
3342	Power supplies and system design and build power systems for telecommunications.
327212	Inorganic material and components for telecommunications, environmental, display, and life sciences.
3341	Information Technology.
3344, 3342,3343	Consumer Electronics, Lighting, Medical Equipment and Services, Semiconductors, Display Components, Optical Storage, Small Domestic Appliances.
3679 3399	Soft magnetic cores- manufacturing
334519	We make photomultiplies and neutron generation for the oil exploration business and aerospace business.
333992	Gas regulators, cutting and welding torches, cutting tips, welding tips, and heating tips; manufacturing plant
33329	Research and design DF nanometer precision pointing mechanisms. Positioning stages, motion, control devices.
33441, 333416	Electronic Components - Design and manufacture digital converters and data bus devices.
333415	The manufacture of and service on air conditioning and refrigeration equipment worldwide.
335312 336413	Mechanical and electronics assemblies; either converting mechanical energy into electricity or one form of electricity into another, exclusively for aerospace and defense vehicle markets
3353	High performance motors, generators, and associated electronics
335311	Manufacture of generator sets, transfer switches, and switchgear.
335312	Power Generation Equipment
33531	Electric Motors- sell small electronic motors to OEM customers in United States, Canada, Europe, and Asia
335314	Industrial Automation and Control Products, Systems, and services
335999	Electronic DC-DC converters
335999	AC to DC power supplies, DC to DC converters, AC to DC battery backup systems.
3343	To carry out the business of designing and manufacturing and sale of electronics and electro acoustical devices for the reproduction of high fidelity sound
3342	Commercial Broadcast Test Instrumentation. High Power RF Systems for Transmitting and Receiving Communications Systems.
3342	Commercial Broadcast Test Instrumentation. High Power RF Systems for Transmitting and Receiving Communications Systems.

3663	Spacecraft
33413	Power semiconductor components; Co. manufactures power semiconductor devices, including thyristors, rectifiers, assembly & custom modules; also distribute semiconductor devices in North America made in Japan
334418	Boats, cars, satellite ground antenna positioning units, wind tunnel sensors, space medicine instruments; Co. is a design/development/assembly facility
334413	Electronic components.
335999	Electronic power supplies: -Design, manufacture, build to print -Low and high voltage, military and commercial
336322	Aerospace and Military Secondary Power systems and Components. Design, Manufacture and Product Support of such systems and equipment.
335	Motion control equipment manufacturer
3364	Provider of electronic components and major electrical systems for the aerospace industry.
226411	As an aerospace manufacturer, Co. designs and manufactures motion control devices for primary and secondary flight control. Products include motors, gearing actuators, controllers, throttles, rudder controls.
336611	Military ships, shipbuilding R&D, design production, test and evaluation, repair/overhaul, programs management, support services, engineering services, technical assistance, engineering technical services, and computer aided design/computer aided manufacturing
3364	Spacecraft and Space Systems. Space Systems/Loral (SS/L) designs, develops, and produces large, highly sophisticated spacecraft for communications, meteorology, and related applications. SS/L also resells launch services as part of a spacecraft delivery
3345, 3364	Company is a major developer and builder of aerospace and defense systems and equipment for the US government and commercial and international aerospace customers. Key products include electronics systems and subsystems for aircraft, launch vehicles
334515, 33422	Sales and services of test, measurement and monitoring equipment products.
334519	Specialty instrumentation and control equipment
335313	Industrial Power Back-up Systems and Power Conditioning Systems - Manufacturer and Designer
421610	Power transmission and distribution substations and other projects. We provide project management, engineering, procurement for substations and other power system installation projects.
7378	A leading global provider of enterprise technology and computer solutions. Compaq manufacturers and markets hardware, software, solutions, and services worldwide.
54133	Research Projects
5417	R&D for company, and government R&D sponsors e.g., DARPA, USAF, NASA, NIA, DOE, ONR, AFOSR, CIA, NSA, FAA

# APPENDIX IV

54171	Research Center is the central unit for research and development activities for company. Products include aircraft engines, gas turbines and space propulsion systems, and air conditioners
Wireless Broadband Reported by Defense Contractors	
NAICS	Products
326199	Optical components
334220	Microwave radios in the 6 GHZ to 38 GHZ frequency bands and from 4DSI/4EI to 155 m/bits (SDH/Sonet) data rates/capacities, primarily sold to cellular and PCS network providers. Also design and service products on a turnkey basis.
3612	AC to DC power supply manufacturer
3342	Manufacture, distribution, and management of standard and specialized civilian and military communications products and systems.
3345	fiber optic test equipment and components
332312	Manufacture and install tower, poles and accessories for the telecommunications market
3342	We manufacture products for mobile communication systems, such as antennas, filters, amplifiers, TX combiners, RX multicouplers and duplexers.
3342	Telecommunications equipment, including fiber optic passive optical networking equipment, audio/video access equipment, and telemetry access equipment.
3342	Communication devices such as multiplexers and ATM concentrators as well as avionics products such as ice detectors, physical sensors, aerial refueling amplifiers for military aircraft.
334220	Design, manufacture and install telecommunication networks for business and consumer markets world-wide.
33422	Free Space Optics (optical wireless communications products)
33422	Cellular radio, public safety land mobile radio, cellular infrastructure, semiconductors, broadband, cable set-top boxes and cable modems, automobile electronics.
33422	Co. provides technology and services to the global market for the full network life cycle of two-way HFC ( Hybrid Fiber Coax) broadband networks. Manufacture Amplifiers, Fiber optic Transmitters and Receivers, Digital video transport equipment.
33429	Telecommunications data collection Telecommunications data management Telemanagement systems
334290	Fiber optic communications products which provide a connectivity solution for copper to fiber; Products include fiber optic modems, media converters, isolators, switches, multiplexers, transceivers, and interface extenders.
334515	Design life science and communications components- fiber optic transceivers and components, radio frequency, microwave, infrared and imaging components
334413	Automatic test equipment for electrical assemblies
334413	microelectronic hybrid modules
4413	Co. leverages state of the art design and R&D engineering to develop, manufacture, test, and deliver high performance integrated circuit and module components in

	support of commercial and US Government use.
33422	EMI filters- the nature of company's business is to design and manufacture electronic solutions and assemblies
334220	Manufacture satellite antenna systems
3345	Temperature instrumentation, pressure instrumentation, fiber optic modem.
334516	Optical components, fiber optics multiplexers, ultraviolet detectors
334515	Instruments for measuring and testing of electronic signals; RF power meters, NOBE sources, NOBE generators, microwave components, FM/AM analyzers for wireless and broadband communications.
334515, 33422	Sales and services of test, measurement and monitoring equipment products.
51331	local and long distance voice, data, and internet services; consumer wireless and value-added services.
51121	Computer software and associated services, software development and sales

Advanced Composites Reported by Non-Defense Contractors	
NAICS	Products
31320	Carbon fiber prepreg.
3133	Vinyl reinforced textiles used for tents, tarps, equipment covers, awnings, banners, signs and other flexible laminated and coated fabrics
3149	Tire cord fabric, textile manufacturing
2655	Packaging both consumer and industrial, including composite cans, paper tubes and cores, recycled paper board, flexible packaging and plastic bags. We manufacture these products.
326111	Plastic Film
325211	
325181	Suspension PVC resins, vinyl chloride, chlorine.
325188	Specialty chemicals
2821	Products include Methacrylate monomers, Methacrylate based acrylic sheet, polymer and resins that go the building/construction industry, retail, transportation, packaging, etc. Final end uses are coatings, paints, adhesives, printing inks, food packaging,
3252	Co. develops, manufactures, and sells microporous membranes. Uses include: battery separators, gas transfer, controlled release, liquid/gas phase contact, and various other uses.
3252	Our primary revenue generating products are unsaturated polyester resins used to make composite parts such as boats, bath tub, and shower stalls, chemical storage tanks, pipes, exterior body panels for cars, trucks, and recreational vehicles.
3252	Provide engineering resins for the automotive industry.
3252	Nature of business: design manufacture and marketing of thermoplastic materials. Primary product: engineering resin pellets for injection molding.
3252	Polyurethane fork life truck wheels and tires.

# APPENDIX IV

3252	Co. is a producer of specialty chemicals for consumer electronics; pharmaceuticals; agricultural, automotive and industrial products; and construction and packaging materials.
3252	Resins for ink, coatings, adhesives and rubber industries.
3252	Manufacture of unsaturated polyester and vinylester resins for manufacture of composite parts such as boat hulls, bath fixtures, fuel tanks, automobiles, etc.
325211	Primary revenue contributing product is polypropylene. Co. converts propylene monomer into polypropylene pellets and sells these pellets to processors and distributors.
326100	Automobile interior trim manufacture.
3252 3256 3255	Automobiles - appearance and repair
3251	Chemicals, plastics, fibers.
3251	Specialty chemicals used for intermediates in a downstream process. Esters and polyesters.
325212	Primary revenue contributing product: advanced silicone material. Business nature: healthcare, aerospace, electronics.
3083	Decorative plastics manufacturing for the boating and recreational vehicle markets.
3259	Plastic color concentrates and compounds
3259	Engineering plastics.
3259	Plastic materials- used primarily in consumer disposable products (e.g. diapers, trash bags)
3259	Plastic color concentrates and compounds
3261	ESD control flooring, wall base. Extruded thermoplastic sheet for packaging and printing applications, calendared PVC film for packaging and engineered applications.
3261	Plastics, components for noise, vibration, and shock control and cushioning.
3261	Toll compounding of plastics materials and additives. These materials and formulations are supplied to us by customers. Co. processes the materials for a fee and sends products to these customers.
3261	Extruded polyester, copolyester, and polypropylene sheet for thermoformed packaging and graphic arts applications.
3261	Industrial die cut manufacture. Converting roll goods into 2D shapes.
32613	Engineering plastics - sheet, rod, and tube profile.
3261	Lighting business 20%; bedding industry 15%; power distribution 20%; motor/appliances 10%; distributors 5%; battery 3%; general 27%
325911	Manufacturer of thermoplastics molding compounds.
325991	Plastic compounder for materials sold into the automotive market.
325991	Produce bulk molding compounds (thermoset polyester and vinyl-ester plastics for automotive, electronic and consumer appliance applications). Our customers are sutom molders who process our material into parts.
5991	Primary revenue contributing products are cars. Co. supplies elastomer-modified thermoplastic olefins (TPOs) and other engineers polyefin materials to the automotive industry.



325991, 333999	Co. manufactures two component polyurethane systems and the equipment used to dispense/process these systems.
325991	Rigid and flexible PVC compounds, sold to manufacturers of (rigid) fittings, extruded profiles, bottles; (flexible) wire and cable insulation and jacketing and profile extrusions.
326, 997	Manufacture extruded plastic mouldings, plastic picture frames and other plastic products.
3261	Dunnage components for automotive parts shipping racks. Plastic material handling tray and shipping trays.
339113	Acrylic/ Plastic Housewares and Accessories
2821	We compound engineering thermoplastic materials (nylon, ABS, polycarbonate) sold to the injection molding market.
2869	Chemicals- raw material manufacturer
3251	Fine and specialty chemicals production
2671	Flexible plastic and paper packaging for food and industrial products; pressure sensitive label products
3061	Custom molded elastomeric components for the automotive and industrial markets
3089	We are a custom plastic injection molding shop, which also performs finishing and assembly work on the molded parts. (As needed by customer)
3261	Flat plastic sheet, plastic binders, molded agricultural products, molded pickup truck liners. We extrude flat plastic sheet, diecut sheet, decorate binders, mold sheet into animal feeders and truck liners and sell sheet to outside vendors.
3261	plastic sheet extrusion
3081/3252/3251	Primary products- flexible PVC film, PET (polyester) resin, filament, staple fiber and ethylene glycol
3672	High performance laminate material for RF Microwave and high speed digital printed circuit boards
334412	Co. manufactures and sells laminates for use in printed circuit boards.
334419	Specialty composite materials for a variety of industries including communications, computer, transportation, printing, consumer and other.
421840 325991	Formulated and processed wax products, liquid resin (epoxy, polyurethane, polyester) systems, lumber and synthetic wood products.
325510	Aerospace and Defense paint and coatings.
3343	Design, build, and operate petrochemical plants and other heavy industrial processes. Complete engineering, pilot plant, scale up, ASME code fabrication, installation, controls, computer programming, operation, start-up.
Batteries Reported by Non-Defense Contractors	
NAICS	Products
326113	Microporous membranes for use in automotive, industrial, energy storage, and medical applications.
334119, 42143	Computer accessories
3359	Sealed V.R.L.A. Electrical storage batteries.

## APPENDIX IV

3359	Assemble rechargeable cells into battery packs (cordless phone packs and camcorder packs).
335911	Manufacturer of lead acid batteries for automotive, commercial, marine, farm, and racing applications.
335911	Lead acid batteries for the sport utility industry
335911	Battery manufacturing
335911	Start-up company- minimal revenue- developing large format lithium ion batteries for automotive and industrial applications
335911	Lead Acid electric storage battery manufacturer, sales and service.
335911	Batteries for cars, trucks, marine and golf cart use. Manufactures lead-acid batteries
335911	Custom assembler of Rechargeable battery packs including: NiCD, NiMH, Lithium Ion, Lithium Polymer
335911	Batteries
335912	Lithium batteries, capacities, micro-machined components, medical feed throughs and electrodes, RF filters
335912, 335911	Manufacturer of primary batteries such as general purpose in zinc chloride and alkaline and button cells manganese and silver oxide. Secondary batteries that are produced include rechargeable nickel cadmium and nickel metal
42269	Batteries and related products
5417	Products: Wet shaving and dry shaving razors, oral care appliances, toiletries, batteries. Business: Manufacturer of packaged consumer goods.
Power Electronics Reported by Non-Defense Contractors	
NAICS	Products
32518, 33149	Production, marketing, and sales of manganese chemical and metal products. Conversion of imported manganese ore to value-added chemical products
326130, 322222	High pressure decorative and industrial laminates. Decorative laminates are used in the kitchen and bath, store fixture and furniture industries. Industrial laminates are used in the cargo liner industry.
3341	Electronic components design and manufacture power supplies.
3341	Electronic components. Design and manufacture storage subsystem enclosures to house CD drive, etc and other computer peripherals such as memory reader, scanner, etc.
3344	Printed circuit assemblies: Keltech is an electronics contract manufacturer.
3675	Electronics components. We manufacture capacitors
3679	Power supplies, telecom systems
3353	Manufacturer of AC variable frequency motor controls
335312	Motors, manufacture mechanical components and assemble into finished motors.
3359	Power supplies
333415	Previously manufactured HVAC equipment, now import from Mexico and Malaysia
3353	Industrial system drives- both medium voltage and low voltage drives for Industrial motors (variable frequency drives). Also Electronic controls for steam

	and gas turbines.
335311	Uninterruptable power supply.
3353	Electrical power distribution equipment and controls
3353	We design, manufacture and sell electronic motion control equipment primarily used in factory automation applications
3359	Microturbine Generators. Design, applied research, development, testing, manufacturing, selling, repair, and overhaul.
33514	Electronic Lighting Controls/Dimmers
3342	Telecommunications: optical multiplexer and software
3344	DC/DC converters We design, manufacture and sell DC/DC converters which are used by the telecom, computer and other industries.
3344	Semiconductors
334419	Electronic components, research and development of electronic components used in customer applications.
3359	Power supplies- we design and build DC/DC converters used primarily in the telecom industry.
336111	Cars, car manufacturer
336322	Research and Development. Co. is automotive components and system supplier.
3344	Electronic assemblies and subassemblies. Full Service Electronic Manufacturing. Contract Manufacturing.
3345	Instrumentation Manufacture Vacuum Gauges and Mass Flowmeters
334517	X-Ray sources and power supplies
42169	Transformers and inductors; importer
31-33	Vehicle Electronic Systems
Wireless Broadband Reported by Non-Defense Contractors	
NAICS	Products
3252	Major Products: Epoxy resins, versatic acids, bis-phenol-A Development, manufacture and sale of specialty and intermediate chemicals
2104	Manufacture and sell high speed DSL equipment
3342	Broadband equipment manufacturer.
3342	Wireless video and audio systems and wireless broadband transmission systems. Co. and its divisions design and manufacture systems integrating wireless technologies for the commercial electronics market.
3359	Manufacturer of fiber optic networking products and photonic products.
335921	Assemble fiber optic cable
3999	Passive optical networking electronic components
3342	Sales of networking products and services
335999	Design and manufacture of custom high voltage power systems for industrial and medical products
335999	Lighting protection devices for wireless market
3342	Hybrid develops and sells wireless networking equipment. Our products compete

## APPENDIX IV

	directly with DSL and Cable modem systems. Our system provides high speed shared internet access over a 35 mile diameter cell.
3342	Broadband solutions that allow communications service providers to deliver video, voice, and data to their subscribers, Harmonic's advanced fiber optic, digital video and data delivery systems enable network operators to provide a range of services
3342	DSL related telecommunications equipment. Develop and manufacture for sale to telephone companies internationally
3342	Telecommunications test equipment and network management tools.
3442	Manufacturer of telecommunications equipment
3663	Microwave radio systems and associated services
3342	Fiber optic systems for high-speed communications (voice, data and video) on the last mile of the network. Develops technology, designed and manufactures products and sells them both directly and indirectly world-wide.
3342	Products: Telecommunications multiplexers. Nature of business: designing, manufacturing, and selling telecom products to telecom service providers.
33421	Co. manufactures a central office telecom platform that enables packetized telephony. Sell the system to wireless service providers to enhance their voice network.
334210	Products: optical switch, optical network gateway, optical add drop multiplexer, optical amplifiers, and optical protector.
334210	Next generation telecommunications switches for voice and Data Networks. We sell infrastructure products to telecommunications carriers and service providers.
334290	FIBER OPTIC COMPONENTS - RESEARCH, DEVELOPMENT AND MFG
334290	Optical switching systems and components, interference lithography systems and services, photonic bandgap research.
3344	Semiconductor based electronic components for wireless and broadband communications applications.
335900	Electrical connectors, optical connectors, electronic sub-assemblies
3678	RF Connectors, Cross Connectors, Patching, Cable Assemblies.
3344	We design, manufacture, and sell semiconductor components (integrated circuits and optoelectronic components) to makers of computer and communications equipment.
3345	Co. designs, manufactures and market electronic test equipment for telecommunication and utility companies worldwide. The primary product line is "Time Domain Reflectometers."
3345	Optical Test Equipment
33422	Free space optical transceivers and related software. Co. sells free optics equipment, and provides broad-band interconnectivity services over its free optics networks in various U.S. cities.
334519	Ultrasonic test and measurement equipment
5133	Website hosting services, streaming media delivery services and video conferencing services. our customers pay for these services on a monthly basis
5179	Telecommunications switch is still in the developmental stage and is not currently generating revenue.

513322	Point to Point wireless link Point to Multipoint wireless link
5133, 5139	1) SS7 Signaling (connectivity, ISUP, TCAP, ANSI 41 Messaging) 2) IN Database access services (Local number portability, Line information, Caller Name, Toll Free) 3) Wireless Clearing for net settlement of roamer access fees 4) Prepaid Wireless
42169 4216	We are a distributor of computer related products. We do some custom cabling and do a very small amount of specialty manufacturing (IE enclosed and battery packs for broadband wireless products requiring minimal R&D)
541511	Computer Software- developer of intelligent broadband service creation and delivery platform. Xauthority- policy-based central management platform.
511210	Co. designs and sells software (PC firewall security software).
511210	Software, professional services, support and maintenance. Operational support software for managing the activation and operation of broadband internet protocol services over communications networks.
541512	Network management software systems
Special Category	
NAICS	Products
3251	Specialty Chemical Manufacturer
331512	Co. sells aerospace, industrial, and automotive fasteners. We design, manufacture, test, and certify these products to O.E.M., Industry, and our internal specifications and requirements.
3342	Manufacture, distribute and manage standard and specialized civilian and military communications products and systems.
3328	Provision of metal surface treatment technologies to the aerospace, turbomachinery and automotive industries.
332911	Engineer & manufacturing of military and commercial nuclear/non-nuclear valves
332911	Engineer and manufacture military and commercial nuclear/non-nuclear valves
332912	hydraulic/mechanical flight control actuators; satellite propulsion controls; motors; pumps and electric drives; servo-valves; solenoids; vibration control actuators; industrial motion control actuators; pneumatic/hydraulic fin controls; engine control components
3341	Live training systems- development and integration. Broadcast data links interfacing, airborne collection platforms to ground stations. Specialized avionics products (e.g. PLS, GPWS).
336411	Unmanned aerial vehicles, electron test equipment, military training systems, electro mechanical systems (material handling equipment, electronic munitions fuses), software development, transportation systems repair and overhaul, and fluid test systems.
3364	Pumping devices for aerospace and industrial applications, valves and fuel systems for aircraft.
3364	Distribute aviation products, and repairs/overhauls aviation accessories (i.e.,

# APPENDIX IV

	wheels, brakes, hoses and batteries).
336411	Co. provides remotely operated aircraft systems to U.S. Government customers primarily for surveillance and intelligence gathering purposes.
336411	Co. is engaged in the concept formulation, design, fabrication and testing of vertical lift products for civil and military applications. Total sales annually are approximately 1.5 billion.
336411	Aircraft structural parts and assemblies. We do not perform R&D
336412	Aerospace engine components and products. Industrial engine and power production components and products. Service for all products manufactured.
336412	Turbine engines- aircraft, power generation
336411	Aircraft ejection seat subassemblies and helicopter crashworthy seats
336611	Design, fabrication, assembly, integration and production of specialty marine craft and light armored vehicles.
3364	Liquids and solid rocket engines and motor; warheads (anti armor and conventional blast); aerospace defense and space contractor
336414	Manufacture for high performance military R&D satellites. Includes design and developments as well as launch and in-orbit operation as requested by our customers. Also 30% NASA work.
334511	Integrated communication, navigation, avionics systems for commercial and military applications, platform installation and integration.
51491, 541511	Funded research and development
511210	Commercial, off-the-shelf software for the aerospace industry (development and sale of)
541710	Co. is a provider of engineering services, high performance space products and systems for the Aerospace industry. Major products include thermal and structural products.
336992	Co. is a leader in the design, development and production of combat vehicles, artillery, naval guns, missiles launchers and precision munitions used by the US Department of Defense and allied militaries around the world.
3364	Aerospace- Sale, service, and after sale support of commercial business jet aircraft.

## APPENDIX V – WRITTEN COMMENTS

### Eliminating Reluctance to Discuss R&D with Public Sector: Survey Respondent Recommendations

#### 5.5.1 *Procurement Complexity*

*Defense Contractors (cited by 32 of 53):*

Be more responsive to industry input in the program development stage. Set more realistic goals and targets. Don't "pick our brains" with modest phase one projects and not through later phases. Deal on a commercial basis.

DoD could embrace more commercial standards.

Eliminate cost share requirements for non-procurement (other transactions) activity. Improve long range budget planning.

Eliminate federal procurement laws and allow agencies to purchase commercial products.

Eliminate government agency competition with industry.

Eliminate military specifications which are difficult to understand.

DD-250 and other "forms" are cumbersome and require special training to complete.

Favored contractor status for R&D.

For new and high risk technologies, remove the restriction(s) to manufacture in the United States.

Actively support the DoD developments to have commercial impact.

Fund development work without requiring government ownership of data.

Don't have individuals with conflict of interests managing funded development.

Get the DOE labs out of space research.

Government procedures and requirements should not increase manufacturing costs.

Increase speed of bringing contracts to fruition.

Increase collaboration of various sub-contractors on major programs for DoD.

Reduce bureaucracy.

More government-to-industry contacts.

Provide a "Quit Claim" agreement for a period of time on a technology area under development.

Question the infrastructure built around existing technologies. Give incentives to labs/agency that field new technology.

Reduce the amount of paperwork/red tape - it costs more to document the product process than they are worth.

Shorten sales cycle - our company has been working with one DoD agency for over two years to license software for a large deployment.

Streamline procurement process; greater flexibility in negotiating individual intellectual property rights.

## APPENDIX V

There are so many concerns; we would recommend working with the Integrated Defense Commercial Company (IDCC) to commercialize government procurement.

Simplify contracts.

Have contracts that are clear and easy to understand by both parties.

Eliminate requirements for products to be on a GSA schedule.

Non-DoD federal labs need to be more willing to allow companies to retain rights to work done on a cost share basis.

Simplify contracts and provide sourcing status with R&D partners.

Do not use Commerce Business Daily or Statement of Work type procurement notices when commercial products are being sought.

Where appropriate, move technology into operation quickly.

We are not reluctant based on any of the issues above. If there is any hesitancy, it is due to typical government agency desire to fund very long range technologies that do not have nearer term commercial potential.

*Non-Defense contractors (cited by 25 of 71):*

Reduce bureaucracy with contracts. Reduce reliance on government accounting standards because they do not always fit business standards. Improve negatives outlined in Question 30 on page 13.

A more open mind-set in federally funded research and development labs would be welcome.

Allow sole source when it is "best in breed."

De-bureaucratization; opportunity for exclusivity, no bidding plus ability to retain ownership of technology.

DoD research procurement process heavily favors established contractors. Encourage new contractors to participate in DoD R&D by lowering barriers to entry.

Eliminate bureaucracy by empowering just two technical representatives.

Government agencies do not have appropriate sense of urgency and speed to market for potentially commercial ventures.

Have a government liaison that is committed to obtaining and acting on the information presented.

Have government utilize commercial planning, management, and contracts. This is permitted by national policy and law (e.g., Commercial Space Act of 1998 P.L. 105-303), but is widely ignored and inconsistently used.

Improve timing of paperwork and payments.

Let businesses develop technology, but not burn time documenting and accounting.

Make government contract process less demanding on possible strategic partners (develop strategic partner relationships with innovative companies).

Modifications to procurement law that mirror commercial law, especially protection of technical data and intellectual property



Multi-year programs- consistent funding, more favorable T's and C's, W.R.T. Patents, I/P ownership and use.

Purchase product directly from my company under standard commercial business practices.

Reduce difficulty in getting funding, and improve notification of potential business.

Reduce paperwork, tracking, office management. Be very sensitive to our need for commercial profit and return. Too many restrictions on how to spend funds.

Simplify contracts.

Simplify federal Acquisition Regulations and Accounting Regulations.

Create cross-agency forums.

Reduce the difficulty in working with agencies and soliciting development funds.

Reduce paperwork and improve decision period process for doing or not doing the work.

Run the government like a business.

More communication at the start of projects. Dedicated resources to the project. Cost estimates during time lined events.

Reduce or eliminate the cost of doing business (i.e., the bureaucracy).

### **5.5.2            *Financial Incentives***

*Defense Contractors (cited by 18 of 53):*

Budget and program stability is an issue inhibiting our ability to work with government agencies.

DoD seems to have a difficult time actually receiving the funds they expect for given areas of R&D.

Expanded use of funded Broad Area announcement opportunities; profit incentives for unique technology.

Make more R&D funds available.

More funding by DoD.

More funding directed outside government agencies.

Non-DoD agencies should have more funds (discretionary) to investigate and follow through.

Discuss and have funds available to act on new things.

Pricing based on quality, delivery, service.

Provide adequate funding on a timely basis.

Provide financial incentives for sharing of data.

Provide funding.

Provide greater financial rewards for acceptable R&D technologies.

Provide R&D subsidies or tax credits for companies whose R&D efforts result in international sales thus generating income for the U.S. Government, like Canada!

Profit sharing incentives to increase financial rewards; higher assurance of funding.

Money made available for advancements in mature technologies.

We would consider an R&D relationship if there was enough money guaranteed.

## **APPENDIX V**

Incentive for operation/fielding on new technology.

Do not usually see direct benefit in end product sales potential in near term. ROI is not early enough to be of interest.

*Non-Defense Contractors (cited by 14 of 71):*

A clear path to substantial return on investment for the company.

A priority business opportunity with a government agency. This could include funding which assisted the commercial business.

Be very sensitive to our need for commercial profit and return. Too many restrictions on how to spend funds.

Clear financial benefits for participating; simplify process.

Commercial incentives and TAX incentives.

Demonstrate financial rewards; publicize a process for working with agencies.

More favorable terms and conditions, W.R.T. Patents, intellectual property ownership and use.

Permit greater company profit.

Reduce difficulty in getting funding.

Reduce or eliminate the cost of doing business (i.e., the bureaucracy).

Increase funding for applied research, including manufacturing readiness, in wireless electronic components for non-DoD applications.

Improve timing of paperwork and payments.

Make it financially feasible to develop the products.

Reduce the difficulty in working with agencies and soliciting development funds.

### **5.5.3           Communication**

*Defense Contractors (cited by 5 of 53):*

Be forward with the long term intent of the program and how many suppliers will be involved.

Communicate more effectively.

Make more information available, re: available funds.

My company needs to know what agencies, which contacts, and what kind of work.

Publication and communication of government needs and technical interests.

*Non-defense Contractors (cited by 27 of 71):*

Adequate information and communication training for improved understanding.

Awareness of DoD groups/needs/activities.

Better educate private industry on how government agencies conduct R&D programs and handle proprietary data.

Better identify funds available for specific research.

Better notification of potential business.

Channel to access needs to be well understood.

Increase interaction with these agencies and increase visibility of the programs.

Know more about the type of programs for which there is interest.

More mutual communication.

Need to better understand opportunity.

Our company has little or no experience in this area.

Publicize a process for working with agencies.

Send information about DoD labs, research programs, potential R&D funding and potential contracts. My company will review and determine if further communication/collaboration is appropriate.

Show me a revenue opportunity.

We are not aware of DoD's R&D needs and hence we have not participated.

We are not equipped or experienced to make any suggestions.

We have no experience working with DoD so we don't have enough information to evaluate above issues.

We need more time and money and interest to be aware of the possibilities to participate.

We would discuss, but we have never been asked. There is no interaction.

We would perform R&D on a needs basis.

Clearly identify process and funding.

Opportunity has not arisen.

Our company has little or no experience in this area.

More communication.

We have no experience working with non-DoD government agencies. If the agencies could take the initiative to contact us and provide more information, that would be helpful for us to evaluate the feasibility.

Better communicate access channels.

We have no idea of the fit of our product or how to approach these agencies.

#### **5.5.4            *Intellectual Property***

*Defense Contractors (cited by 12 of 53):*

Don't harass private companies to provide proprietary financial information that is irrelevant to the proposed development cost.

Good strong non-disclosure agreements.

More protection of company proprietary technology used as a springboard to new research.

More training of government agencies on protection of proprietary information.

Non-Disclosure Agreements.

Risk of inadvertent intellectual property or data loss.

## APPENDIX V

The use of outside contractors by the government can limit discussions due to concern over leakage/disclosure of information. Put in place safeguards against leakage/disclosure of information.

Tougher restrictions and protection of knowledge shared with DoD.

While we are willing to discuss R&D programs with companies and Government Agencies, we do so under the terms of a written Non-Disclosure Agreement.

Demonstrate that companies need not be concerned about government protection of proprietary information.

Stronger non-disclosure language in contracts.

Have non-disclosure agreements that are clear and easy to understand by both parties.

*Non-Defense Contractors (cited by 12 of 71):*

Clearly communicate to industry that R&D is conducted under non-disclosure. Have a well understood program to ensure government employees can not use intellectual property exposed to them during their work for the government if they transition to the private sector.

Confidentiality agreements, exclusivity agreements, and patent and trademark rights.

Confidentiality agreements.

Higher government employee ethics, especially for government contractors.

Intellectual property protection.

No problem for pre-sales evaluation, but is a concern for R&D level collaboration.

Protect secrets.

Unwilling to discuss new technologies until patent protected. Will discuss after patent approval.

Protection of companies' intellectual property.

Allow the company to retain proprietary data.

General concern about tainting of company's IP.

Keep proprietary information protected.

### **5.5.5      *Product Irrelevance***

*Defense Contractors (cited by 4 of 53):*

Our R&D efforts are mainly with DoD prime contractors; not with DoD directly.

Our research organization is structured solely for internal product and process development. We are not currently structured for joint development programs.

This is mostly not applicable since our plant operation does very little pro-active R&D. Most of our work and formulations are done based upon customer's demands and requirements.

My company produces revenue by producing in high volume. Government does not buy in high volume.

*Non-Defense Contractors (cited by 15 of 71):*

My firm does not generally interact with DoD and non-DoD agencies for R&D efforts because we are a supplier of RVC resins and not end-use products.

Change scope of products.

My company does not perform R&D relevant to DoD agencies.

Most of our business has no applicability to DoD or federal agencies.

Our product line does not match government needs.

Our technology is not useful to DoD.

We are strictly commercial.

We sell industrial automation equipment and do not target government or DoD accounts.

We work primarily in product sectors that are not of interest to DoD.

We are not opposed to discussing our R&D programs with non-DoD agencies, but we are so far down the supply chain that it is typically not applicable.

My company does not generally interact with federal agencies or R&D efforts because we are a supplier of RVC resins and not end-use products.

We would have to change the scope of our products from non-technical to technical.

My company's R&D is not applicable to public uses.

In our industry we would not use government agencies to commercialize R&D.

Our business is a toll (service) business. We have no R&D.

### **5.5.6      *Small Business***

*Defense Contractors (cited by 5 of 53):*

Make it easier for small companies to bid on technology proposals directly without going through large government system integrators.

Need a non-burdensome method for smaller business to pursue R&D contracts and grants.

Shorten sales cycle - our company has been working with one DoD agency to make it easier for small companies to bid on technology proposals directly without going through large government system integrators.

Substantial barriers to entry for limited available funding.

Government agencies favor working with "systems integrators" vs. component and material suppliers and make it difficult to apply for grants.

*Non-Defense Contractors (cited by 10 of 71):*

Communicate needs and embrace small manufacturing companies.

Develop a small business "fast track" process.

We are not opposed to discussing our R&D programs with non-DoD agencies, but we are so far down the supply chain that it is typically not applicable.

We do not want to enter into programs for federal agencies - do not have resources to pursue.

We have two people working part-time. I doubt we could handle the paperwork, even if we had ideas of interest (which we don't).

My business is too small to pursue true research. We develop products from existing technology. Obtaining government contracts/rewards is too demanding on the resources of a small company like mine. Make process easier.

Develop a fast track process for smaller businesses. It appears that information from a smaller organization is not as highly regarded as information generated by a larger organization.

Communicate needs to small enterprises.

We are too small (90 people) and must focus on our business plan. Not interested in government contracts at present.

## **Changes to Government Laws and Policies: Survey Respondent Recommendations**

### **5.5.7        *Procurement complexity***

Defense Contractors (cited by 59 of 91)

Eliminate federal government cost accounting standards; eliminate cost and pricing data requirements and certifications; and procure R&D on commercial terms and conditions.

Streamlined procurement; reduced reporting requirements; and simplified contracts.

Accounting control.

Closer adherence to Commercial Contract and Accounting practices.

Continuous streamline acquisition.

Cost accounting requirements.

Delete the preponderance of DoD/FAR regulations that do not need to be imposed on R&D effort and eliminate reliance of NASA clauses that are unique to NASA.

Ease of working with agencies and getting to right people.

Eliminate all CAS, FAR, compliance, cost accounting, and audit provisions. Liberalize IPR provisions.

Eliminate cost principles of the EAR.

Eliminate federal procurement laws and allow agencies to purchase commercial products.

Elimination of "red tape" which slows projects and adds cost. Also, provide a better understanding of any opportunities.

Fast track approach to select truly technically competent companies at a reasonable (not necessarily lowest) price.

Faster process.

Favored supplier status for R&D companies and provisions for contractual alliance if R&D leads to commercialization.

For other than R&D, follow commercial practice and delete government unique terms and conditions.

Greater acceptance throughout DoD for utilizing commercial products and suiting them for defense use instead of relying on historical government contractors to design from scratch one shot (or few copy) items. DoD is missing great opportunities to tap into the commercial expertise that is developed.

Greatly reduce internal R&D capability of DoD agencies; it inhibits use of industry for DoD.

Improve training, shorten acquisition deadlines, eliminate superfluous regulatory oversight and greater use of multi-year (long term) programs/funding.

Improved program continuity and delivery schedules.

In many cases, labs compete with industry due to the recent growth in their technical capabilities.

If the labs' involvement was limited, it would encourage more teaming with industry. This limitation could be tied to funding categories. For example: 25% on 6.1 programs, 15% on 6.2 programs and 5% on 6.3 programs.

Less bias regarding preferred technical approaches, commercial contracting terms.

Less bureaucracy.

Less restrictive export control regulations when dealing with registered Canadian companies.

Less time consuming to complete bids.

Long term commitments.

Make DoD "easy to do business with." Too much red tape, paperwork, controls, etc.

Make it simpler/easier to "purchase, rent, utilize" the capabilities available at the labs, etc.

Make rules item-specific instead of using the same procurement regulations applicable to both butler and space laser acquisition.

Many changes would be required so we suggest working with commercial industry groups like the IDCC.

Make paperwork less complicated (especially billing).

More streamlined and direct "point of contacts" without as many split responsibility at program/project level.

More truly multiyear procurements, elimination of TINA and CAS.

Multi-vendor telecommunications services environment required. Currently no new providers are able to provide services under FTS 2000 regulations.

Possibly less paperwork.

Procurement and regulations outdated; based on 20-year life cycle, etc. Change procurement laws to recognize today's technology life cycle and the fact that 2/3 of funding for R&D in the U.S. comes from private sector. Government needs to make it easier for contractors to "sell" them technology.

Procurement process needs to be streamlined to allow cost appreciation and in turn, deliver product to consumer in a timelier manner.

Procurement regulations need to be revised to promote the use of commercially available technologies rather than reinforcing cost-plus, invented-here mentalities whereby contractors

## APPENDIX V

reinvent the wheel over and over on various programs on a more expensive and less efficient basis.

Product changes require too many signatures and take too long to sign off on. Reduce the path to critical people.

Recognition of commercial business pricing and project management; broad use of other transaction agreements; updating R&D.

Reduce or eliminate administrative oversight in areas of socio-economic programs, financial, property, and certain quality programs.

Reduced paperwork. For example, assist by offering on-line downloadable templates in Word or Excel for forms, reports, material control, etc., and more active inquiries (sourcing) from DoD and other Agencies.

Relax ITAR regulations, demand "buy America" first.

Remove requirements that cause us to maintain two separate legal entities and financials.

Require less red tape!

Research available commercial alternatives before funding redundant, competitive work.

Shorten sale cycles, empower individuals to make decisions to implement new technologies.

Shorten the time required to award a contract.

Shorter times from R&D to production.

Simpler proposals, less onerous contracting procedures.

Simplify contracts; institute preferred sourcing status with R&D partners.

Simplify procedures.

Statute that would remove the DOE labs from space work. They are competitors. They also compete with DoD labs. Strictly limit use of OTA and section 845 transactions.

Streamline bidding process, make more funding available.

The coordination of R&D in space technology across all federal organizations needs to be streamlined. It should be consistent with a Technology Road Map (See Space Technology Alliance). More direct involvement in the Laboratory development and other architecture processes.

The SBIR program needs to be eliminated as a method of developing second/alternative sources of supply for production programs and development programs.

The willingness of DoD to consider alternative sources for existing and future products is imperative to provide more attractive and productive relationships.

Too bureaucratic - massive reporting requirements.

Use of more efficient contracting instruments such as "cooperative agreements" and "other transactions" as we do with DOE.

### *Non-Defense Contractors (cited by 37 of 76)*

Access to product specifications and simplification of quoting process.



Accounting methods should direct commercialization charges and patent costs to grants and contracts.

Change procurement policy, increase order volumes, shorten bid-delivering purchasing cycles, and reduce vendor qualification period and paperwork involved.

Contract to the private sector on certain projects - cost factors discussed and payment plans met.

Eliminate bureaucracy. Empower two technical representatives. Communicate goals. Stick to long-term commitments. Reward innovation and cost-saving. Simplify application, accounting, and regulatory language.

Faster decision making and funding, commitments to quantities beyond prototype, protection of IP and patents.

Faster, less red tape, movable to keep confidential and change intellectual property ownership.

If DoD were to operate in a fully commercial manner.

Improve the ease of dealing with the agencies.

Improve timing of paperwork.

Less bureaucracy, evidenced by this mandated long survey.

Less bureaucracy.

Less legal adversarial relationship, federal acquisition and accounting regulations/red tape simplification.

Less paperwork.

Less red tape would encourage more projects.

Less red-tape.

More accessibility, less bureaucracy. Work with private industry in a similar manner in which two industries would work together.

Most of the DoD research is controlled by DARPA, which favors large projects and incumbent contractors. The DoD research laboratories (AFRL, NRL, ARL) must be empowered to select their own research partners directly.

Much less paperwork, reporting, accounting overheads; emphasize dual-use commercial/military.

Need fewer laws, not more. Free purchase directories for DAR.

Purchase product directly, following standard commercial practices.

Reduce bureaucracy with contracts and reduce reliance on government accounting standards because they do not always fit business standards.

Reduce paperwork and process overhead (i.e., reporting requirements, meetings).

Reduce paper/administrative burden; eliminate outdated standards (i.e. built-in bias for certain suppliers).

Reduce security constraints.

Reduce reporting mandates and additional compliance requirements.

Separate routine procurement postings from those requiring development.

Simplified accounting, better marketing of opportunities, simplified procurement procedures.

Simplify accounting systems.

## APPENDIX V

Simplify administration, cost accounting and reporting requirements. Major overhaul of government procedures needed. More lead time is needed as resources very thin.

Simplify the rules.

Simplified contractual and audit procedures.

Too complex to simply state what changes are needed.

Too complicated [simplify].

Uniform MIL Specs that allow use of existing commercial products and mimic actual end-use requirements.

Update the labs to current standards of technology.

Work with commercial business or commercial terms.

### **Communications**

#### *Defense Contractors (cited by 16 of 91)*

Better communication of the opportunities to private industry; when receiving a contract, there is a risk that DoD programs could be pulled, leaving our investment in development of the contract worthless.

An easy method to help small companies identify opportunities.

Awareness of DoD requirements.

Better communication of needs, timeliness.

Better communication of collaborative opportunities and federal grant requirements.

Communication structure.

Ease of finding requirements and getting to right people. Ease of working with agencies.

Fund contracts for products that are suitable for our manufacture.

Knowing what if any contracts are available.

Made aware of opportunities. Regular information sessions.

On one hand, open the system up as much as possible re: contracting information - continual improvement necessary.

Provide more information to industry identifying the capabilities available at the labs, etc.

Publication and communication of government needs and technical interests.

There needs to be better publicity about how to get involved in these programs.

We do not know how to begin. We need an easy way to learn how to present my company to DoD.

We need to know how and why DoD and non-DoD agencies need specialty films.

#### *Non-Defense Contractors (cited by 22 of 76)*

Better communicate access channels.

Better communication on DoD areas of research and development and improved means of identifying opportunities for joint work.

Better knowledge of opportunities.

Better system for distributing requirements and documents, especially at early stage concept development initiatives.

DoD needs to make inquiries known and seek out services.

DoD should, if they want to work with us, have some way to inform us of their interests/needs.

Guiding and targeting technical companies like ours to specific projects.

Improve programs designed to help companies find opportunities to assist DoD organizations.

Knowledge of the programs would encourage more projects.

Make policies, opportunities more available (paraphrased answer).

Make programs and opportunities more visible.

Make public lists of technologies DoD is seeking.

Make the opportunities within DoD more visible.

Require more knowledge of opportunities.

Need to understand opportunity.

No suggested law changes. The DoD is very large and it is very difficult to find the correct person or department to speak with.

Perhaps better dissemination of opportunities including presentation of business benefit. On-site presentations to companies not involved with DoD projects would help. Explain available opportunities and present cases where other companies, not previously involved in DoD projects, realized a business benefit.

There is a lack of follow-up and the overall process including overall goals has been unclear.

Unfamiliar with those laws and policies. There should be a mechanism to bring strategic companies like my company into the national discussion for we are conducting R&D and selling products that will dictate the future of telecommunications.

My company would be interested in working with DoD organizations to provide website hosting, video conferencing and video streaming services if it were easier to learn about potential opportunities and if the contractual process was not overly complicated.

We don't know where to locate information which parallels our capabilities.

We need to be able to work with organizations to determine their needs. This requires access to contracts and formations.

### ***Intellectual Property***

*Defense Contractors (cited by 16 of 91)*

Allow DoD organizations to enter into and be bound by non-disclosures with respect to intellectual property.

Allow exclusivity in intellectual property ownership.

Allow data developed under cost share type agreements to be treated as "Limited Rights" data by the government.

## APPENDIX V

Changes in intellectual property ownership rights allow companies more control and protection of their IP. This is particularly needed in those cases where IP was born out of companies' research and development work. DoD needs to invest more in technology development, reduce the cost match percentage required in other transaction agreement contracts.

Improved data rights.

Improved understanding of rights in technical data.

Intellectual property rights.

Intellectual property, re: procurement rules.

Issues dealing with intellectual property regarding services paid for and use of product developed from those services.

Make intellectual property rights the same for Canadian and US companies with industry owning the inventions.

Protect confidential information of companies in a way that penalizes individuals that misuse provided information. Allow companies to retain ownership of confidential information.

Protection of proprietary information.

Provide better IP protection - tough to reach a proper balance - continual improvement necessary.

Stronger non-disclosure language in contracts.

Update R&D IP clauses to reflect commercial partners' R&D.

We would be prepared to work for the DoD if we did not have to obtain and maintain security clearance.

### *Non-Defense Contractors (cited by 8 of 76)*

DoD wants best available technology but also hates to be sole sourced. If you get a unique product approved, DoD will push your competition to copy it. Therefore, you do not always feel rewarded for providing the best.

Guarantee intellectual property security.

Improved management of intellectual property.

Keep proprietary information protected.

Protection for company intellectual property.

Protection of intellectual properties - not government owned.

Strengthen confidentiality.

W.R.T. Patents, I/P ownership and use.

### **Financial Incentives**

#### *Defense Contractors (cited by 13 of 91)*

A consistent and reliable funding plan with multi-year committed funding.

Discourage DoD agencies from seeking industry cost sharing; recent DoD policy statement is not being adopted uniformly.

DoD must continue to fund R&D for "mature" technology including flight control and propulsion. Only SBIRs remain funded in these broad areas. Funding has been near zero for many years.

Greater return on investment.

It would benefit private contractors if more basic science and research funds were available instead of being directed to government labs and organizations.

More consistent funding and higher allowable profits.

More government funds for dual-use R&D and transition!

More projects/contracts and less "low price" contract awards, source credit for quality and delivery, as well as R&D, cost sharing program for improving value (price, quality, life, services).

Our R&D is directed at opportunities for production. When an R&D opportunity does not have a clear production opportunity there is little interest in the R&D opportunity.

Prompt payment.

Prompt payment of progress payments and better adherence to program time lines.

Speed up contract progress payments; increase allowable contract.

The intellectual property ownership and R&D collaboration rules need to be changed to assume an adequate return on investment can be generated.

#### *Non-Defense Contractors (cited by 10 of 76)*

A shorter cycle with regard to "time to revenue." My company's experiences with SBIR R&D are that from the time the contract is awarded until funds begin to flow to the company is much too long. With a shorter cycle we would be more aggressive in pursuit of government contracts.

Improve ability to make profit.

Improved timing of payments.

Make them more appealing.

More latitude in use of funds.

More profit margin.

Multi-year programs - consistent funding, more favorable terms and conditions.

Need financial incentive.

Offer incentives to collaborate with DoD. Possible tax incentives for R&D efforts in conjunction with DoD projects.

Permit greater company profit.

### **Small Business**

#### *Defense Contractors (cited by 10 of 91)*

Do not use Research and Development Contracts as an automatic set aside for small business.

DoD organizations collaborate primarily with Prime Contractors; they should work with the subcontractors that supply products and processes to the Primes.

## APPENDIX V

Increase preference for small businesses.

Make it easier for small companies to be aware of federal opportunities.

Make opportunities available to consulting firms of smaller size. This would save government money due to lower overhead.

More stress on R&D by small business.

Most contracts are awarded to the Primes. Award more contracts directly to the subcontractors and keep them simple and straightforward so they can be managed at lower costs.

One major issue is that the DoD agencies use large defense contractors and do not use innovative "off the shelf" solutions from small companies. This needs to change so that fast paced smaller companies can successfully work with DoD organizations.

Reduce or eliminate growing requirements for cost sharing for small businesses, especially in SBIR/STTR program. Current policy seems to make cost sharing mandatory for Phase II funding.

My firm has not had any direct business relationship with the federal government. We would like to engage in a business relationship with the federal government if the government processes, procedures, and standards requirements were simplified for small organizations.

### *Non-Defense Contractors (cited by 7 of 76)*

Available funding for small businesses.

DoD should work with small companies.

General recognition of limited resources of small companies.

I work for a small company that is a fully-owned subsidiary of a larger company. Consequently, we are not a small business and don't get the benefits. Please change the definition of small business in regard to government technical R&D contracts (SBIR, etc.).

It will be helpful if DoD can promote joint R&D programs designed for smaller companies.

More money for small business research programs. Ability to collaborate with larger companies in limited activities, with the goal of enhancing the technical and market success of the developed project.

Small companies do not have the resources to follow the myriad rules necessary to compete with R&D at the federal level.

### **Product Irrelevance**

#### *Defense Contractors (cited by 1 of 91)*

Our current work with DoD is through our joint venture with another company. That company maintains and handles the relationships and contracts.

#### *Non-defense Contractors (cited by 8 of 76)*

Again our products are not related to core competitors in the DoD.

No comment- our firm has no particular interest in working with any Governmental agencies as our products are solely for the commercial marketplace.

Not qualified to answer this question since we have no experience in this area. For our company it is a matter of focus, some companies focus on military/government work as a business strategy and structure their businesses accordingly; we do not.

Not sure. Our business has little, if any, overlap with the interest of DoD. Some of our customers do have involvement with DoD and other federal agencies.

My company's technology is not useful to DoD.

Technology must match between DoD and our business.

We are only interested in commercial business.

We don't see any application for our products within DoD or non-DoD related government organizations.

## **General Comments**

The final portion of the survey gave companies the option to write general comments. A total of 173 companies did so. Sixty-two companies were defense contractors, 93 were non-defense contractors, and another 18 were not identified as either. Many of the comments were statements of exemption and many others were clarifications of certain responses to other questions in the survey. A number of companies were upset with being asked to complete the survey when they considered it did not apply to them. Many others made useful comments. Selected comments are reproduced here.

### ***Defense Contractors***

This survey was mostly not applicable to our operations. We make no finished goods. We sell raw materials to plastics industry. Other manufacturers make end products. Once in a great while we might supply product for a customer who is using our product in a DoD application. Most of the survey does not apply to our company. We are a manufacturing company and do not perform R&D on any regular basis.

Government contracts tend to be limited in quantity releases, indefinite deliveries, etc. which for small companies makes it hard to be economical in buying materials and components. My company tends to release only small quantities at a time due to limited funds, thereby putting small businesses at a disadvantage.

The government acquisition needs to focus on Best Value efforts and Buying Practices. The small gross profits on particular contracts do not make it economically feasible to operate a business, particularly on FFP contracts.

Ready, willing and able to accept government contracts. However, since our manufacturing is based in Germany, this has become difficult.

## APPENDIX V

Our company was founded to sell products to DoD. Today, we only support a small amount of old military spare parts. We would be interested in working with the Government but we don't see a clear financial return.

In general DoD does not often contract for components on a multi-year basis like most commercial firms. Budget constraints cause many delays in funding, which impacts a supplier. The escalation of costs is not fully recoverable.

This survey should have been sent to business leaders instead of engineers. I am an individual contributor for design and analysis rather than business development. Therefore, this survey has been answered with my very limited knowledge of the business field.

Conducting business with the federal government generally requires employees with extensive experience in this area to be successful. As a small company, funding specialized resources for an area that has such long sales cycles and smaller profit margins is difficult. Only now that we have grown to a sufficient size are we now able to begin adding these resources and are beginning to reach the government market.

We do very little contracting with any branch of the government. Therefore, we have an extremely small knowledge of the various programs for research and the like.

### ***Non-Defense Contractors***

My company serves the metal casting industry...primarily patternmakers, mould makers and plastic tool builders. We have not solicited the U.S. government for business mainly because of paperwork complexity and supplier qualification requirements.

Is there a document available that explains the how to, where to, and what to regarding government business? Is there an easy way to find sorted opportunities to bid on instead of looking for a needle in a haystack?

This survey has little to do with the fine and specialty chemical business of my company. Our only interaction is the production of anhydrides which are subsequently used by other companies for the possible production of composite materials.

Although everyone at my company loves their country, the political and social agendas embedded into the federal contract and procurement process along with the incessant volumes of bureaucratic record keeping make it impossible for us to seek business with the government. We would love to sell plastics to the government if it behaved like an ordinary customer. This would be the same for joint development efforts if they were ordinary business relationships.

Unfortunately, we are not resourced properly to participate as things stand today. This survey may be the starting point to turn this situation around.

This was very difficult to complete due to the fact that the longest portion of our internal R&D is done by our Swiss parent company overseas. I answered these questions with data from our US department to the best of my ability. We do virtually no R&D here in the states.

It is hard to answer questions about the DoD because we've never thought much about opportunities with the DoD. We did have two men from the DoD stop in and review our



operations just to familiarize themselves with our capabilities and how they may apply. I can't make much comment because I can't pass judgment in many of these areas. We haven't worked with the federal Government, so I don't know how hard or easy it may be.

My company's engineering resins would provide products for government contracts, but we are not aware of any government applications that would utilize our nylon and pet resin compounds. My company has only provided test material to NASA. We have never done any other business with the DoD. We do not have an R&D function. That is why "N/A" is used as an answer on several questions. We are willing to look at future defense projects and are willing to share our knowledge.

Since our business centers around converting synthetic fibers into short cut lengths, we do not perform much R&D work on the end fiber products. Instead, our R&D and design & engineering is focused on improving our production machinery and production processes.

Most of this survey does not apply to this company. We have never worked with the US government. Our R&D is strictly for internal use.

We have no experience (to the best of my knowledge) dealing with DoD or non-DoD agencies for the last 50+ years. I could not accurately answer most questions without more information and/or experience.

As a custom plastics manufacturer, we are not involved in pure research. We can however offer our engineering and manufacturing experience and expertise in producing complex, difficult to mold, products thus offering economic and performance improvements.

We have no interest in doing business with the federal government.

Most questions not answered because we have no experience in the given field.

My company wishes to focus 100% on the commercial market.

My company holds or has pending patents on some of the most compelling technology in the power electronics industry. Certainly this technology could benefit DoD or other federal agencies. We will be presenting a professional advancement course on some of these developments at Power Systems World in October 2002. If we can be of service and we can be paid for that service we would have an interest in doing business with the government.

I found that filling out this survey was a great waste of time.

My company is a commercial manufacturer of vacuum and flow instrumentation. We fund our own R&D. We occasionally sell our products to DoD and other government agencies under our commercial terms and conditions at published catalog specifications and prices. We will build special products for DoD and other government agencies if contacted by them directly, but only under our commercial terms and conditions.

We have no interest in government contracts therefore this questionnaire is irrelevant. Why don't you have this as an exemption up front?

No incentive to share R&D without near term revenue.

I have no experience with the DoD and therefore cannot answer the majority of questions.

## APPENDIX V

We would love to do business with the U.S. Government, but we are a small company. The government seems to only award contracts to big companies. We are a low cost manufacturer and our R&D is spent on machines we make ourselves to improve quality, cost and efficiency. My company is a state-of-the-art startup company. Funding and policies to favor/ease market entry are the areas that would interest us the most. We are selling the future of high-speed internet access, voicemail communications and video transmission. Government policies and laws to nurture and aid in the viability of our efforts are most welcomed.

My company is interested in collaborating with DoD in R&D areas that are aligned with its business objectives. The empowerment of DoD research laboratories to select their own research partners can increase the participation of companies like ours in DoD R&D.

Our company's last DoD contract was with LLNL about 10 years ago. We worked on a proposal for about 18 months for a DoD subcontract from a major prime contractor, expending about \$100,000 and did not win the job. Proposal efforts seem MUCH too expensive and involved... we made the decision to focus on commercial and industrial business instead of government. We are a very small company and do not provide R&D services for any other organizations, just for our own product development.

## APPENDIX VI – WHITE PAPER FROM AEROSPACE INDUSTRY ASSOCIATION

### *Creating an Environment for Commercial Practices and Investment in Space*

#### **Issue**

Commercial space business is impeded by lack of commercial practices in government space procurements and by lack of investment incentives.

#### **Facts**

The U.S. space industry has historically been tied to the government way of doing business. Now that a commercial U.S. space industry exists, government policies and practices have the potential to substantially and negatively impact commercial space business endeavors. Declining U.S. government research and development budgets, a marked rise in both commercial and government investment by international competitors, and recent world economic problems mean that U.S. space activities suffer from a lack of adequate investment. At the same time, today's budget priorities and the President's FY2002 Management Plan call for making the government "more market based" and more focused on results.

Federal legislation and national policies have shifted from a preference for acquisition of items developed exclusively for the government to the acquisition of commercial items. However, their interpretation and implementation within the various government agencies are subject to wide interpretation. Government procurement offices hold extensive discretion in how they purchase commercial products and services and in applying "commercial" acquisition practices. Unfortunately, this discretion results in inconsistencies in commercial item determinations, as noted in USD (AT&L) Memorandum,<sup>1</sup> dated July 10, 2001. As a result, companies continue to face the imposition of significant accounting, contracting, and purchasing requirements that go beyond what is required by statute. Also, the current commercial item procurement process generally uses annual contracts that require an inordinate amount of time and resources to award.

Further, the annual contracting process precludes predictability for industry. DoD's recent "Commercial Item Handbook" is a good first step to address this issue with DoD, but no similar approach exists at NASA. Passage of the Federal Acquisition Streamlining Act of 1994 and the Clinger-Cohen Act of 1996 fundamentally altered the way federal agencies are to approach the acquisition process – from the planning of each government purchase to the implementation of

## **APPENDIX VI**

resulting contracts – by introducing “commercial” provisions in the FAR. The FAR instructs agencies to define requirements “in terms that enable and encourage offerors to supply commercial items” [FAR 11.002(a)(2)(ii)].

An underlying theme of FAR Part 12 is that the acquisition process should be applied with flexibility to facilitate use of commercial providers and that contracts include only those clauses that are consistent with customary commercial practice [FAR 12.301(b)]. The NASA Act of 1958, as amended (P.L.106-377), provides the basis for NASA’s organization and role in aeronautics and space.

In Section 102 (c), “Congress declares that the general welfare of the United States requires that the National Aeronautics and Space Administration seek and encourage, to the maximum extent possible, the fullest commercial use of space.”<sup>2</sup> The National Space Policy of 1996 states that, “U.S. Government agencies shall purchase commercially available space goods and services to the fullest extent feasible” and encourages, “to the fullest extent feasible, the cost-effective use of commercially provided U.S. products and services that meet mission requirements.”<sup>3</sup>

The Commercial Space Act (CSA) of 1998 (Public Law 105-303) further directs all federal agencies to use commercial providers whenever space transportation services are needed, confirming Congressional intent that commercial principles be applied to government acquisition of launch services.<sup>4</sup> Section 101(a) of the CSA declares that the use of free market principles in servicing the International Space Station will reduce costs. Section 201(a) requires, “To the maximum extent practicable, the Federal Government shall plan its missions to accommodate the capabilities of U.S. commercial launch providers.”

Under prior law [42 U.S.C. § 2465d(a)], only NASA was required to purchase launch services from commercial sources, and then only for its “primary payloads.” The CSA of 1998 places an affirmative obligation on every agency to tailor its programs to facilitate acquisition of launch services from commercial sources. Although these legislative efforts have established the policy mandate and flexibility to incorporate commercial practices into government procurement, commercial practices and contracts are not utilized regularly in space procurements and are the exception rather than the rule. In practice, the words “maximum extent practicable” are a significant source of interpretation and serve as a blanket rationale for not using commercial practices. Industry continues to encounter resistance from procurement offices in using commercial FAR Part 12 regulations.

### **Discussion**

Government policies and practices have the potential to substantially and negatively impact

commercial space business endeavors. Government use of commercial acquisition practices and creative investment incentives could help existing and emerging commercial space companies provide competitive services to the government as well as develop new markets and compete for space business worldwide.

### **Commercial Practices**

Rather than supporting the commercial space industry in advancing toward economic recovery and demonstrating effective ways to work with industry on a commercial basis, the government continues to use traditional acquisition regulations and procedures when commercial products, services, practices and mechanisms are available. The use of the traditional approach seems to arise from a lack of adequate training of government acquisition personnel in the use of commercial practices and a risk-averse acquisition culture that discourages innovation. Consequently, procurements that would benefit from commercial designation are not so designated, and instead are structured using more traditional acquisition procedures.

It appears that a perception exists within the government that use of traditional contract methods somehow ensures quality, safety, and mission success. In reality, excessive focus on acquisition regulations and government oversight diverts money and energy away from meeting mission requirements. Their use prevents government access to commercial markets in many cases since they discourage many commercial companies from participating in government procurements. The Defense Reform 2001 report, “A Blueprint for Action,” addresses this problem by calling for minimizing strict requirements in all acquisition programs and focusing on overall system performance characteristics, rather than regulating how the requirements are met<sup>5</sup>.

The use of commercial practices and contracting mechanisms in government acquisitions can be a “win-win” situation. Commercial practices and contracts are useful, effective management tools for the government to meet its needs by focusing resources on mission success (i.e., to pay for performance and results rather than overhead). They also allow companies to provide their commercial products and services to their government customers at competitive prices, making the American tax dollar stretch farther. Commercial practices encourage innovation and efficiency – making the U.S. industrial base more competitive by lowering costly and burdensome expenses related to non-productive government-required activities and reporting. This, in turn, frees up manpower and capital to stimulate new markets and creates incentives for the private sector to develop new technology.

### **Investment Incentives**

## **APPENDIX VI**

In addition to eliminating barriers caused by inconsistency in government use of commercial practices, many creative means could be used to help existing and emerging companies develop new markets and compete for business worldwide. This would ultimately lead to a more robust, lower cost industrial base from which the government could procure commercial space items. Examples of such creative means include tax incentives and/or credits for investment in new space systems, providing spaceports the same tax free bond authority granted to airports, and allowing more transparent procedures for export of purely commercial space items. Also, the government must proactively assist U.S. companies in protecting their ideas and creations by improving and enforcing intellectual property and proprietary data rights, consistent with the National Space Policy of 1996.

Such incentives could spur investment in the space industry, leading to innovative ideas in an industry long considered a low-return business. Commercial involvement could also enable a broader base of participation in important space activities, such as R&D and infrastructure, and encourage and stimulate competition. Through permanent investment incentives, the government can demonstrate its commitment to a strong space industry with a healthy commercial component, and to the development of next generation space technologies, services, and markets.

### **Alternatives**

In many circumstances, commercial companies must either forego government business opportunities or compromise their commercial business model by accepting contracts with many expensive, government unique requirements. When a commercial company foregoes government business, the government misses the opportunity to access innovative, competitive products and services from a non-traditional government source.

Similarly, the government's failure to implement adequate investment incentives causes commercial companies and investors to continue viewing space activities as a low return business. The result will be continued loss of market share to foreign competitors by the U.S. space industry.

### **Recommendations**

o NASA, DoD and NOAA should identify and implement pilot programs to test and utilize commercial practices. Commercial practices include use of commercial terms and conditions as well as management approaches used by industry. The commercial space transportation services sector – which can often offer lower costs, reduced cycle times, increased availability and greater reliability – is an ideal candidate for such a pilot program.

o Ensure that acquisition reform mechanisms are fully utilized. Commission leadership is needed to facilitate a cultural change in acquisition approaches and ensure that federal agencies are honoring both the letter and the spirit of existing federal statutes and national policies.

Example of actions that should be taken include:

- o The government should identify and address disconnects between government direction to use commercial practices and the implementation of this direction.
- o The government should increase training/education of government acquisition offices (from top to bottom) to foster an understanding, utilization, and application of commercial practices as well as encourage and reward innovation.
- o The Government should adopt a strategy of “once commercial, always commercial.” Once a product or service is acquired as a commercial item, then that product or service should be designated as commercial for future procurements by all government agencies.
- o Congress should create and support investment incentives. Incentives should include tax credits, tax-free spaceport bonds, and protection of intellectual property that encourage private sector investment, stimulate new markets, and contribute to economic recovery in the space industry. Such incentives would spur investment in the space industry, leading to innovative ideas in an industry long considered a low return business.

## Notes

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<sup>1</sup>USD (AT&L) Memorandum for Component Acquisition Executives et al, July 10, 2001, Subject: “Consistency in the Acquisition of Commercial Items.”

<sup>2</sup>NASA Act of 1958 (amended) (P.L. 106-377) <http://www.hq.nasa.gov/ogc/spaceact.html>

<sup>3</sup>National Space Policy of 1996 <http://www.ostp.gov/NSTC/html/fs/fs-5.html>

<sup>4</sup>Commercial Space Act of 1998, HR1702 (P.L.1005-303) <http://thomas.loc.gov/bss/d105/d105laws.html>

<sup>5</sup>“A Blueprint for Action,” (Final Report), AIAA Defense Reform Conference, Feb. 14-15, 2001, Darleen Druyun, Executive Chair <http://www.defensereform.org>